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THE

NATIONAL GEOGRAPHIC MAGAZINE

AN ILLUSTRATED MONTHLY

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VOL. XI—YEAR 1900

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WASHINGTON
THE NATIONAL GEOGRAPHIC SOCIETY
1900

WASHINGTON, D. C.
JUDD & DETWEILER PRINTERS
1901

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WASHINGTON
PUBLISHED BY THE NATIONAL GEOGRAPHIC SOCIETY
FOR SALE AT BRENTANO'S:
31 UNION SQUARE, NEW YORK; 1015 PENNSYLVANIA AVENUE, WASHINGTON;
218 WABASH AVENUE, CHICAGO; 37 AVENUE DE L'OPERA, PARIS

Price 25 Cents $2.50 a Year

THE

National Geographic Magazine

AN ILLUSTRATED MONTHLY

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The list of contributors to the NATIONAL GEOGRAPHIC MAGAZINE includes nearly every United States citizen whose name has become identified with Arctic exploration, the Bering Sea controversy, the Alaska and Venezuela boundary disputes, or the new commercial and political questions arising from the acquisition of the Philippines.

The following articles will appear in the Magazine within the next few months:

"Russia," by Professor Edwin A. Grosvenor of Amherst College, Massachusetts.

"The Venezuelan Boundary," by Mr Marcus Baker of the Venezuelan Commission.

"The Samoan Islands," by Mr Edwin Morgan, Secretary of the Samoan Commission.

"British South Africa and the Transvaal," by Col. F. F. Hilder, Bureau of American Ethnology.

"The Characteristics of the Filipinos," by Hon. Dean C. Worcester of the Philippine Commission.

"Explorations on the Yangtse-Kiang, China," by Mr Wm. Barclay Parsons, C. E., surveyor of the railway route through the Yangtse-Kiang Valley.

"Patagonia," by Mr J. B. Hatcher of Princeton University, who has passed the principal part of the last four years in the exploration of this little-known region.

The index for volume X, 1899, will accompany the February number.

THE PHILIPPINE ISLANDS AS THE GEOGRAPHICAL CENTER OF THE FAR EAST

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THE

NATIONAL GEOGRAPHIC MAGAZINE

VOL. XI JANUARY, 1900 No. 1

THE PHILIPPINE ISLANDS AND THEIR ENVIRONMENT*

By Hon. JOHN BARRETT,

Late United States Minister to Siam

In accepting the invitation of the National Geographic Society, I am not unmindful of the honor conferred or of the responsibility resting upon me to tell the truth about a portion of the world which has such an important bearing now upon our national welfare. It will be my simple purpose to consider within the limits of time at our disposal the Philippine Islands as seen and known by me in times both of peace and war, including such description of their environment or of neighboring countries as will best indicate the commercial and strategic value of their location. This discussion will be no effort at oratory or rhetoric, but an honest endeavor to tell you what I learned with unprejudiced eyes.

The invitation to speak under the distinguished auspices of the National Geographic Society suggested that the treatment of the subject should particularly include the material and geographical features of the Philippines and their environment. It would not be wise, therefore, to enter upon any extended argument of the moral problems involved in our occupation of the islands, although they are important, except insomuch as they are interwoven with our political status in the Pacific, which in turn is closely associated with commercial and geographical considerations.

During five years' residence in the far East, four of which it was my honor to be the United States minister to Siam, it was also my privilege to travel not only well over Siam, which today is making more progress than any other Asiatic land except Japan, but also, in

* A lecture delivered before the National Geographic Society, December 8, 1899.

greater or less degree, through China, Korea, Siberia, and Japan on the north and Burma, the Malay Peninsula, Cambodia, Java, Borneo, and the Philippines on the south, going first to the latter without any thought of their ever coming under the American flag.

An extended trip through the Philippines some years ago, in times of peace, and a protracted stay again later, in times of war and insurrection, from May, 1898, to April, 1899, will, I trust, enable me to bring forward a few facts that will be of interest.

IMPORTANCE OF LOCATION

First let us consider the location of the Philippines and of Manila. The great importance of this point is too often overlooked in the discussion of the islands, though nothing can have a more direct bearing on their practical value to the United States. We have often thought of the Philippines in a general way with reference to the far East, and we perhaps have read extensively about their resources, physical characteristics, and people, but we have not given sufficient attention to the remarkable position which they occupy in relation to other lands.

The map of trans-Pacific countries is a most fascinating study. What it reveals is a series of impressive facts. From Melbourne, in Australia, on the south, to Vladivostok, on the north, is a magnificent coast line which reaches away for eight or nine thousand miles, and upon which debouch over five hundred millions of people. Without consulting the map, we do not always remember how closely connected Australia is with the continent of Asia. This coast line, of which the Philippines are one of the chief outposts, is only broken here and there by very narrow straits, while everywhere it is indented with harbors and bays, upon which, especially in Asia, there are located great cities or commercial entrepôts. As we travel up and down from Australia to Japan we find that the Philippines are the very ideal center of all these lands that face the Pacific. The more one studies the far East the more is he impressed with the importance of this location with reference particularly to control of the commerce and politics of the future. Already the foreign trade of Asia, the East Indies, and Australasia amounts to the grand total of two billion dollars, of which the United States at the present time has a small proportion. That trade, although large in itself, is small in view of the total population of that part of the world, and is yet in the infancy of its development and possibilities. If it is two billion dollars now, it will surely go on within the near future to three or four bil-

lion dollars, of which America should eventually have the controlling share if she will hold the great advantage which she now possesses by the occupation of the Philippines, where she can have a distributing and receiving point to come in close contact with these millions of people and of commerce.

I contend that Manila occupies a position of immeasurable opportunity in comparison with the other great ports or cities of the Asian and Australian coast line. That you may obtain a concrete idea of what I mean, let me picture how Manila stands with reference to neighboring points. Let us draw a circle on a radius of two thousand miles, with Manila as the center. As we swing it around we find that this charmed circle takes in such distantly separated points as Yokohama, Vladivostok, and Tientsin on the north and Port Darwin, in Australia, and Batavia, in Java, on the south. It reaches east to include Guam and the Carolines and west to include Bangkok, in Siam, and Rangoon, in Burma. A similar circle drawn around any other port does not include so many important points. I would not imply that Manila will ever take the place of Hongkong, Shanghai, or Singapore, or even equal them in the race for commercial and political supremacy, because they already have a wonderful start; but there is abundant reason why Manila should become a great trade center to divide their business, and at least be the chief point through which America shall carry on her growing transactions with Asia's millions. It must be remembered that we have only recently entered this vast arena with any prospects of being the chief factor in trade. When we fully realize and improve our opportunities, then we should build up a great American city at Manila as the English have prosperous ports at Hongkong and Singapore, the Dutch at Batavia, and the French at Saigon.

Manila Bay opens on the South China Sea, which is teeming with the commerce of the Orient as the Great Lakes of America are busy with the trade of our interior. But more than that, there pass up and down through this sea, within hail as it were of Manila, the mighty fleet of ocean craft that crowd through the Suez Canal and pass Singapore to and from Europe and the far East. Formerly these vessels never thought of stopping at Manila or having regular connections. It was always Spain's policy to keep the Philippines in the background. They were enshrouded in mystery; and even at Hongkong, only 630 miles away, with her great trade of $250,000,000 per annum, there was no just appreciation of the opportunities in the Philippines.

The growing fleet of merchant vessels that ply between China and Australia are finding that Manila is on their direct route and are already stopping, both coming and going. The time must soon come when the majority of the steamers that cross the Pacific from our own shores will make Manila their terminal point instead of Hongkong, or provide themselves with the best of connections. Then there are unlimited possibilities for the development of coasting trade, with Manila as the base and Yokohama, Kobe, Port Arthur, Chifu, Shanghai, Amoy, Hongkong, Saigon. Bangkok, Singapore, Batavia, Port Darwin, and Sydney as objective points.

VAST NEIGHBORING OPPORTUNITIES

Moreover, in all the attention that we have been giving in recent years to Japan and China, we have overlooked the mighty opportunities of southern Asia and of the rich East Indian Archipelago, which in turn rests, as it were, upon growing Australia. Every one knows what a great future awaits the latter country. Just north of it, and near neighbors to the Philippines, are such countries, undeveloped, but possessing splendid resources, as Papua or New Guinea, Borneo, and Sumatra, any one of which is larger than Texas and California combined, and yet containing a very small population. They may be intended by a wise Providence for the overflow that must come some day from the continent of Asia. Only fifteen hundred miles to the southwest of Manila, and just below Borneo, is Java, commonly called the Garden of the East, where the Dutch have worked wonders. A more peaceful and prosperous land, taken as a whole, cannot be found in the wide world. This island, of the same area as Luzon, and yet not so resourceful, supports a population of over twenty millions and has a foreign trade that amounts to $260,000,000 per annum. How few people in America realize that Java is covered with a network of railways and has large, prosperous cities, whose harbors are frequented by the merchant vessels of all lands. Here we have a lesson as to the possibilities before us in the Philippines.

The occasional insurrections that occur in certain parts of Java and Sumatra are tolerated or allowed by the Dutch largely for the purpose of having a reason for maintaining an army and navy. It is a well-known fact in the Orient that Holland could end all possibilities of local wars there if the officers of her army and navy were so inclined.

Only 1,300 miles southwest from Manila is Singapore, Britain's proud gateway to the Orient, which has an annual commerce of

$180,000,000. Just north of Singapore are the protected Malay states, which again prove to us what we can do in the Philippines with the natives when we once establish peace, order, and good government. The Filipinos are a branch of the Malay race and closely akin to the people living in the Malay Peninsula, as well as to those in Java.

A little farther to the north, at the head of the Gulf of Siam, is Bangkok, the prosperous capital of the progressive kingdom of Siam. This is one of the unknown lands of the world, but yet one of the most interesting and resourceful. With a population of eight millions, it already has a foreign trade of $25,000,000, which will soon grow to five times that amount. With a king who now ranks as one of the ablest statesmen of all Asia, and with material improvements and political reforms being made throughout his entire domain, Siam has a brilliant future before her.

Just across the South China Sea and east of Siam are the French possessions of Cambodia, Annam, and Tonkin, where even the French, who are not generally regarded as successful colonists, have established peace and prosperity among twenty millions of people and developed a foreign trade, despite their "closed door" methods, of $50,000,000 per annum. Its capital, Saigon, is a beautiful city—a little Paris in the Orient.

CHINA'S GREAT FIELD

Having now noted the importance of the environment of the Philippines on the south and west, which means so much for the future prosperity of the islands, in the same way that the prosperity of any American city or state depends largely on the surrounding states and cities, their population and resources, let us now look to the north. The distance from the Philippine coast to China on the northwest is only six hundred miles. Formosa is barely more than four hundred miles away, and has in itself a great material future from which Japan hopes to reap a decided benefit.

Hongkong, which has always been the chief point of approach to the Philippines and is only six hundred and thirty miles from Manila, is a monument to British enterprise. Its annual trade exchange is now passing the $250,000,000 mark. The day I left there to return to America I counted over 60 merchant vessels loading and unloading in her harbor. We stand now looking upon the great empire of China, which affords America the most tempting field of trade expansion yet undeveloped in the world. Here is a vast land of four

million square miles, greater than all the United States, with a population commonly estimated at 350,000,000, or five times that of the United States, and which has only 350 miles of railways. This one point, to me, is a complete description in itself of her possibilities. It is difficult to imagine the extent of the material development that must follow the early construction of extensive trunk and branch lines of railway. There is crying need now for 25,000 miles of railroads, which means a safe investment, including what goes with such construction, of $500,000,000.

To impress upon you further China's possibilities, let us look at what may be the limits of her trade when once she has a good government established and her interior is opened up. We will obtain our conclusions by comparison with Japan. Japan, which under ordinary conditions would not have a greater buying and selling capacity than China, has built up in twenty years a foreign trade from $30,000,000 to $240,000,000. The present population of Japan is forty millions, giving a trade of $6 *per capita*. Now, let us apply that rate of $6 to a most conservative estimate of China's population, two hundred and fifty million, and we have a possible annual trade of $1,500,000,000. If you divide this in half for the imports, you have $750,000,000. If you look over the list of Chinese imports, you will find that two-thirds of them can be supplied by the United States if she will enter into earnest competition with other countries. Already we have shown what we can do by developing in northern China within a few years an annual trade of $10,000,000 in manufactured cotton goods, and in southern China of $6,000,000 in flour. In both lines our sales were inconsiderable ten years ago.

If any one says that China has not a great buying and selling capacity when she is opened up, he must remember the experience of the Yangtze Valley. Some forty years ago one or two ships and $500,000 represented the trade of that mighty stream. Today you can go up the Yangtze 600 miles, from Shanghai to Hankow, in finer steamers than those plying between New York and Albany, and the annual trade of the river is estimated at nearly $75,000,000. From this you can conceive what must come when the vast interior sections of China are covered with railways, and the same development follows that has characterized the Yangtze River. It is not discouraging that Chinese trade is now only $250,000,000 a year, or $1 per head. It rather shows what great opportunities remain yet to be

developed by the United States and other lands. That same argument might have been advanced against Japan twenty years ago.

In the limits of time at my disposal I cannot discuss Japan specifically beyond saying that there never was a time in the history of our relations when we were closer to that country in commerce and trade than now. Korea is just opening to us, and is providing fields of exploitation which we must not neglect. In Russian territory to the north there are also opportunities which we must fully realize in considering the value of Oriental trade. Already we are doing much there which is encouraging for the future.

Before closing my references to China I cannot refrain from emphasizing the importance of our government's efforts to maintain the "open door" of trade and preserve the integrity of the Chinese Empire. The "open door" simply means that we shall have the same rights of commerce throughout all China as are possessed by any other country and as guaranteed by the treaties. We have everything to lose and nothing to gain by the division of the Chinese Empire. Now, we can look forward to controlling the larger portion of her trade in successful competition with other nations; but if China is divided or the door is closed, whatever country has the predominant influence in a certain portion of China will establish such regulations, directly or indirectly, as will prevent our exports from competing successfully with its own.

MATERIAL VALUE OF PHILIPPINES

Now, what shall we say of the Philippines themselves in their material aspects? We have already shown their geographical, strategical, and commercial relations to the rest of the Orient. Under depressing Spanish influences there was developed in the Philippines an annual trade of $33,000,000. Under American control and with American enterprise and capital this surely must be enlarged within the next ten years to $150,000,000. If the British, Dutch, French, and other nationalities have been successful in accomplishing the results already shown in dependencies less resourceful than the Philippines, it is a confession of weakness if we cannot outstrip them in this work. The Philippines are blessed with an unusual number of great staple products, of whose possibilities I took careful note as I traveled through the islands. Chief among these are hemp, tobacco, sugar, copra or the dried meat of the cocoanut, and rice. The raising of and the trade in these staples have been developed to their present

status with practically the same methods and conditions as existed many years ago. New methods and additional capital will quadruple the output and bring so much more wealth to the country. The lesser products of the country include coffee, cocoa, cocoanut, vanilla, pepper and other spices, indigo, and a great variety of fruits characteristic of the tropics. There are sections where Indian corn thrives, while strawberries and blackberries have been grown with success in the northern plateaux. There are, of course, many other products of the soil, but here I am only calling attention to the principal ones which attracted my eye in passing. The tobacco is grown in the northern section of Luzon, in the valley of the Cagayan River; rice in the provinces between Manila and Dagupan, in the center of Luzon, and hemp in the southeastern portion of Luzon. In the Visayan Islands, as well as in parts of Mindanao, sugar is the chief product, while the pearls that please the vain world come from the Sulu group. Thus it will be seen that the products of the islands are well distributed throughout their entire extent.

The wealth in minerals and metals is not fully known yet, but there are sufficient indications to enable us to conclude that their resources in these lines will be worth careful development. There are numerous outcroppings of coal and iron ore, with indications of copper, lead ore, tin, and platinum; also there are found sulphur, mercury, alabaster, jasper, and marble. The more precious product of gold undoubtedly exists in paying quantities, while there are some favorable signs of silver.

On the extensive ranges of mountains in Luzon and in Mindoro and Mindanao are to be found forests of most valuable woods. The variety is surprising. It includes everything from soft palm and bamboo to ebony and ironwood. There is abundant material on the one hand for furniture and cabinets, and on the other for ship-building and heavy house construction.

LAND CONFORMATION AND AREA

As I traveled from Aparri, on the north end of Luzon, south through that island, thence through the Visayan group, then to Zamboanga, in Mindanao, I was impressed everywhere by the marvelous intermingling of well-watered, extensive valleys with broad, fertile plateaux and high forested mountains. The conformation of the land impresses the traveler as being suited not only for unlimited cultivation, but for the support of a great population. The number of rivers and lakes

navigable for small craft during a good part of the year is large. No other group of islands in the world possesses so many harbors and bays suited for inter-island traffic. The separation of the group into many islands has a most distinct advantage, which we do not fully appreciate. It provides highways of water, which are always there, and permits frequent and easy communication with all important points. The Philippines are more valuable to us divided as they are than if they were one broad extent like Borneo. This breaking up will also be of great assistance in preventing serious insurrections in the future.

The area of the Philippine Islands, 115,000 square miles, according to the best surveys, is more fully appreciated when we say that it is approximately equal to the six New England States and New York. Luzon would cover the State of New York, while Mindanao would hide the State of Maine. The Visayan Islands, with Palawan, Mindoro, and the Sulu group, would equal Vermont, New Hampshire, Rhode Island, Massachusetts, and Connecticut.

As the possibilities of railway construction showed what may take place in China, so likewise do they teach us the extent of the field of development in the Philippines. In this area of 115,000 square miles, with a population of eight millions, there are only 135 miles of railway, or between Manila and Dagupan. According to the best European experts who have traveled through the islands, there is immediate need for the building of from 1,000 to 1,500 miles of railway, a safe investment, including accessories, of from $50,000,000 to $75,000,000. For instance, the great Cagayan Valley of Luzon should be tapped by a line from Manila, while other roads could be built in various directions where there are freight and people to carry. Down in Mindanao are valleys as large as the State of Connecticut which can only be developed properly by the construction of railways. A score of similar opportunities could be named on a greater or less scale.

CONDITIONS OF CLIMATE

As to the climate, it can be said that the dangers of the tropics are grossly exaggerated by those unfamiliar with them. After a residence of five years in the very heart of the tropics, I will say that men can keep well and vigorous there if they exercise ordinary moderation and care and absent themselves at reasonable periods in northern climes for rest and change, as men do in our American cities during the heat of summer. The Philippines contain most favorable conditions for offsetting the disadvantages of mere tropical location. At various

points up and down the entire length of the islands are lofty mountains, on the higher slopes of which one can reach at any time of the year an atmosphere that is practically temperate and always most refreshing and invigorating. Within near distance of Manila are mountains which can be utilized for hotels and barracks, which our government officials, officers, and soldiers can seek for change and rest during the brief period which is oppressively hot. As soon as means of communication are established between Manila and such points, it will be surprising to witness the effect upon the foreign inhabitants. What an army experiences in the severe tests of warfare in the tropics is not a just measure of the conditions of ordinary life. No one, I think, would contend that the Philippines are an ideal home for the American laborer, but they afford broad opportunities for men who occupy managing or directing positions. The natives and the Chinese will provide the ordinary day laborer in abundance.

THE PEOPLE OF THE ISLANDS

Of the people who inhabit the Philippine Islands I can say, after extended acquaintance with them, that their good qualities far outweigh their bad qualities. When they are not misled or misguided by ambitious leaders in regard to America and the American people, they will become peaceful subjects of our government. When once order is fully established, there will be little or no spirit of insurrection manifesting itself, except where now and then, as in any land, some headstrong, unscrupulous leader may endeavor to resist the government. The majority of the Filipinos are far above the level of savages or barbarians and possess a considerable degree of civilization. It is the small minority that are wild and untamed in life, habits, and system of government. It is my honest opinion that we shall be able to develop there a large degree of autonomy in the interior provinces and towns, and gradually from year to year make the islands approach nearer and nearer to a condition of self-government something like that of Canada or Australia. It may take a considerable period of years, but the people are naturally quick to learn, and among them there are undoubtedly many able men to hold the more responsible posts.

Too much credit cannot be given the Philippine Commission appointed by President McKinley, consisting of President Schurman, Admiral Dewey, General Otis, Colonel Denby, and Dr Worcester, for

their labors and for the wisdom of their report. If the methods they recommend are followed closely, there is little doubt that the ends desired will soon be accomplished.

AGUINALDO AND HIS POWER

Of Aguinaldo I can say that he is undoubtedly a man of much executive capacity. He has also a degree of personal magnetism, mingled with sufficient persistency, energy, and shrewdness to be a successful leader of his people. He does not, however, impress one as possessing stability of character. It is difficult, in conversing with him, to catch and hold his eye. His glance could be called shifting. He dresses with remarkable taste and neatness, and makes a favorable impression on those who meet him, but he does not inspire confidence among foreigners. Were temptations to personal power removed from him, I believe that he would be a greater influence for good than for wrong, but under ordinary circumstances his personal ambition controls his motives and methods. Having known him first at Hongkong, before he returned to the Philippines, and later at Cavite, Bakor, and Malolos, I speak from extended acquaintance, in which I was able to note carefully his characteristics. Having been familiar with what passed between him and Admiral Dewey, and having discussed the matter repeatedly with both of them, I can say, in utmost frankness and honesty, that Admiral Dewey never, by written or spoken word, gave Aguinaldo any assurances whatsoever of independence. He simply and only treated him as a friend fighting a common enemy. Aguinaldo, however, with natural shrewdness, saw the opportunity to impress upon his people the fact that he was supported by the American Government, and so told them; otherwise it would have been difficult to secure their general support in forming a government and in mobilizing an army. This fact was often impressed upon me by the Filipino leaders who were not entirely in sympathy with Aguinaldo, but understood his methods and plans.

When men declare that we are shooting independence into the Filipinos, or are establishing a government without the consent of the governed, they must bear in mind, first, that Aguinaldo's government was established almost entirely by the use or show of force, in that he organized an army at Cavite and then sent garrisons to all important points, from Aparri on the north to Zamboanga on the south, everywhere impressing the people, who had no modern arms, with his strength and compelling them to acknowledge his authority;

second, that never have one-fourth of the people at large in the islands been in active sympathy with Aguinaldo, and not that number would have supported him had he not exhibited so much armed force and allowed them to be misled in regard to the intentions of the American Government; third, that if an American army of five thousand men had been landed at Cavite at the same time Admiral Dewey destroyed the Spanish fleet, it would have been received by the people with joyous acclaim, and would have been able to go through the entire length of the islands, heartily welcomed by the people, with no thought of resisting us. Several Filipino leaders admitted to me, in the presence of some of our army officers, that there would never have been active resistance to the United States Government, and we would hardly have heard of Aguinaldo except as a former leader, if we had been in a position to send our garrisons where Aguinaldo sent his at the beginning of our occupation of the Philippines. Our government, however, cannot be blamed for not doing this, because it was a physical impossibility to have landed an army at Cavite when Dewey arrived there, and in those days we did not dream that Aguinaldo's fighting the Spaniards meant the long warfare with him which has since followed.

FALSE EDUCATION OF THE PEOPLE

It is well to bear in mind that there has at no time been any serious resistance to us by the people in any part of the islands where the Tagaloc garrisons or Tagaloc army had not already been located or had not operated. A most extensive system of false education, which is not generally known in America, was also carried on among the Filipino masses during the long period between the fall of Manila, in August, 1898, and the outbreak on February 4, 1899. By a pernicious system of circulars, letters, and newspapers printed from the presses of Manila and Malolos the people were taught to believe most misleading reports about the American people and the American Government. Men, women, and children were exhorted to distrust us, and lies without limit were told of our own government to men and women to make them fear and hate us. I have in my possession many illustrations of this lying literature. Added to this was the constant hope of the Filipinos, inspired by matter that came from America, that the turn of political conditions here would cause the United States to withdraw from the Philippines and establish Aguinaldo at the head of an independent government. Their leaders

never lost an opportunity to exhort their army and people to the belief that the American people would force their President to haul down the American flag. This is well known to every man who, like myself, came into close association with the Filipino army and people.

In considering the favorable account that I give of our opportunities in the Philippines and in surrounding countries, I would ask all those who are skeptical about both the present and the future to bear in mind that my conclusions are not post-bellum opinions, adapted to the minute or to be in line with public sentiment. Before I ever dreamed that the American flag would fly over the Philippines, I outlined in official reports, in letters to chambers of commerce, and in magazine articles America's great opportunities for the extension of her trade and influence in far eastern countries, including the Philippines, and hammered away year after year endeavoring to arouse greater interest than existed. At that time I went on record as saying that after having traveled through all the Asiatic lands, I believed that, in proportion to area and population, the Philippines surpassed them all in variety of resources and undeveloped opportunities. What I say now is simply in confirmation of former contentions.

If you were to ask me to give some of the necessary immediate influences that would assist in making America forever the paramount power of the Pacific, I would enumerate: First, permanent sovereignty over the Philippines; second, construction of the trans-isthmian canal; third, preservation according to the treaties of our trade rights throughout all China; fourth, the laying of a trans-Pacific cable. Further considerations of immediate importance are the early sending of a commission to fully investigate and report on Asiatic markets, as outlined in the forceful message of President McKinley, the upbuilding or reasonable subsidizing of our merchant marine, and—a new but important proposition—the extension of our parcel post system of mails to the far East to compete with similar European systems.

EFFECTS OF DEWEY'S VICTORY

In concluding I can give you no better argument in favor of our meeting our responsibilities bravely and successfully in the Philippines than the experience there of the representatives of the United States Government before and after Admiral Dewey sailed into Manila Bay and destroyed the Spanish fleet. Prior to May 1, 1898, there is no denying that American prestige, influence, and commerce among

Asia's 500,000,000 were at a low ebb, despite the best and the faithful labors of ministers and consuls. In Japan, in China, in Korea, and in Siam the United States was regarded as a second or third-rate power. While we ministers were treated with differential and patronizing consideration, we were not potent factors like our colleagues from Great Britain, Russia, Germany, and France. In trade, the agents of our business houses were endured, but not welcomed by the heads of great European and native firms in the far East. With the battle of Manila Bay there came a mighty and a marvelous change, of which I cannot speak in too strong terms, and the truth of which will be confirmed by every American who was familiar with the situation. There seemed to sweep up and down this 5,000 miles of coast line, and far into the interior, a tidal wave of American prestige, which left its trace and influence not only in the capitals of politics and trade but among the masses of distant provinces; and all at once ministers and consuls found themselves the representatives of a first-class power and standing shoulder to shoulder with the representatives of European nations, if not even leading them in influence and importance.

In other words, we became, by the battle of Manila Bay and the occupation of the Philippine Islands, the first power of the Pacific, for the control of which we seem to be destined by the great influences which shape the politics of the world and develop nations for mighty responsibilities. If we bravely perform our duty in the Philippines, establish peace and order, give the people a large degree of autonomy, spread the influence of our free institutions and hold there a position of commercial and strategic advantage for the advancement and protection of our vast growing interests in the Pacific and far East, we shall be forever the first power of the Pacific and of all the world. If we are laggards now, we shall be laggards until doomsday. If the war and occupation of the islands costs us hundreds of millions of dollars now, another war, which would inevitably come in the future if we should try to regain the position lost by withdrawing from the islands and to lead in the merciless race of nations for material and moral supremacy, would cost us ten times as many million dollars.

THE use of the North Sea and Baltic Canal by ocean-going vessels is slowly but steadily increasing. The entries during the month of October numbered 2,669, with an aggregate tonnage of 385,176, as compared with 2,436, with a total tonnage of 330,843, in October, 1898.

THE CAPE NOME GOLD DISTRICT

By F. C. Schrader,

United States Geological Survey

On arriving at St Michael late in September, 1899, at the close of the field season's work in the Yukon country, we found that ocean transportation from St Michael to Seattle could not be obtained before about October 10, when the N. A. T. & T. Company's steamship *Roanoke* would sail. The interim of a couple of weeks' waiting was accordingly improved by repairing to Nome for the purpose of collecting such geologic and topographic data of this new district as time, circumstances, and climate would permit.

As our boats, tents, and camping outfits had been left in the Yukon country, our party was dependent for such accommodations at Nome or from the miners on the creeks and in the gulches. The topography was in charge of Messrs T. G. Gerdine and D. C. Witherspoon, while the geology and topography were done by Messrs Brooks and Schrader. The latter, with knapsacks of sleeping bags and provisions, made a several days' trip into the mountains and gulches to examine the formations and gold diggings. On account of the snow, cold weather, and freezing up of the creeks, most of the gold claims had been closed down early in October and the operators had departed. Wherever the miners were found to be still present, however, their hospitality was generously extended, notably by Mr F. P. King, members of the Pioneer Company, and other miners on Anvil Creek.

The Cape Nome district is situated on the northwest coast of Alaska, on the northeast arm of Bering Sea, at the entrance of Norton Sound. It is the southern promontory of a large peninsula, extending westward toward Siberia between Kotzebue and Norton Sounds, and largely separates Bering Sea from the Arctic Ocean. Westward this peninsula terminates at the 168th meridian in Cape Prince of Wales, the most westward extension of the American continent, which is here separated from Asia by Bering Strait, about 60 miles in width.

The promontory on which the Nome district occurs has long been known on nearly all Alaskan maps by the name of Cape Nome. The district lies about 100 miles northwest of St Michael, and just outside

HIGH MT. RANGE.
Unexplored.
Quartz.
Good Sleigh North Portage.
Prospect Cr.
Fk.
East Fork.
Gravel Cr.
Steep Cr.
Quartz Cr.
Quartz.
Not Prospected.
Burg Cr.
Blatchford Cr.
Willow Cr.
Unexplored R.
Willows
SPUR RANGE
Lit Boulder
Foot Hills
Little Done Above Creek 1898
Prospecting Rock
Glacier Cr.
Glacier Fk
CANYON
Middle Fk.
Snow G.
Rich Ground
Quartz.
Fk.
Boulder Cr.
Good Prospects.
Mountain Cr.
Discovery
Discovery Fk.
Cape Rodney.
SPUR RANGE
Swamps and Marshes.
No Name
Peacer Cr.
Willows.
Foot Hills.
Anvil Cr.
Rich Ground
South Fk. Cr.
Gold
Silver Cr.
Cooper Cr.
Dry Cr.
Foot Hills.
SPUR RANGE.
NOME CITY.
Nome River.
B E R I N G S E A
Sledge I.
Sand Reefs.
To Healy or St. Michael 725 Miles.
To Golofnin Bay 80 Miles.
Cape Nome.
SECTION MAP OF
GOLOFNIN BAY AND
CAPE NOME GOLD FIELDS.
GREEN HORN MT. RANGE.
BENDELSON MT.
GOLDEN PK.
Gold Quartz Metamorphic Formation
Omilak
Silver and Lead Mines
Papan R.
GORGE.
SPUR RANGE.
Gold Run
Snow Ball Cr.
Dutch Willows
Ophir Cr.
Melsing Cr.
Eclipse Cr.
Neukluk
Warm Cr.
Willows
Johnson City
Gold Bottom Cr.
Cake Cr.
Sweet Cr.
Mystery Cr.
County City
R.
River.
Cascade Pargs or Kosoritak Cr.
Elkhorn Cr.
Pine Cr.
Slate Pine.
Slate Cr.
Lime Cr.
Sledge
Houghtons Bar
Kuzeruk R.
Large deposite quartz gravel. Looks fine.
Proposed townsite of A.B.M.T. & T. Co.
Well Timbered with small Pines
DEXTER RIDGE.
Fish
WHITE MT.
at Healy, St. Michael Island.
Military Reservation
N.
W.
E.
S.
Northern Boundary of C.S.
Vegetables such as Potatoes, turnips, beets, radishes, carrots, cabbage and lettuce grow here.
GOLOFNIN BAY.
TRUAX RANGE.
WHALE BACK RIDGE
Chenik Mission. Dexter's Store.
Anchorage
Icknetuk Pt.
Golofnin Sound.
Rocky Pt.

of the Fort St Michael Military Reservation. By ocean steamer route it is nearly 2,700 miles northwest of Seattle, and about 750 miles from Dutch Harbor, Unalaska. The Cape Nome region as known at present extends from Cape Nome, the apex of the promontory, some 30 miles or more northwestward along the coast and about 20 miles inland to the north. In the middle of this shore line, at the mouth of the Snake River, the thriving city of Nome is situated.

PART OF NOME FROM THE BEACH — LOOKING NORTHWEST

From Cape Nome for 30 or more miles westward to near Synrock the shore line is comparatively straight and smooth, but lying back of the shore line, between it and the base of the mountains, occurs the well-known tundra. This consists of a strip of treeless, moss-covered marine gravels, forming a coastal shelf, which along the beach is about 30 feet above sea-level. From here it slopes gently upward until at the base of the mountains, some four or five miles from the beach, it attains an elevation of 150 or 200 feet. During the summer it is usually wet, soft, and boggy and is dotted here and there by a few

ponds, and is traversed by the Snake, Nome, and Cripple rivers and other smaller streams which carry out the drainage from the mountains.

Along the north edge of the tundra, at the beginning of the mountains, the topography is low and rounding, with the floors of the main valleys rather flat and from one to three miles in width. Seven miles north of Nome, crude gravel terraces, seemingly marine, were observed to the height of about 1,500 feet. These seem to mark successive stages of land elevation still going on.

Further northward, 20 or 30 miles from the beach, the mountains become more rugged and rise, in some instances, into seemingly permanent snow-peaks, but probably nowhere exceed 3,000 feet in elevation.

The nearest harbors for deep-sea or ocean vessels are Port Clarence, 60 miles northwest of Nome, and Golofnin Bay, the same distance northeast. It is not unlikely that one or both of these harbors will be connected with the Nome district by rail should the district prove as rich as present prospects indicate. Port Safety, a small harbor to the east of Cape Nome, will admit vessels not drawing over eight feet of water, but is not adequate for the accommodation of deep-sea-going vessels. In front of Nome the sea is so shallow that the larger vessels cannot approach the shore, but are obliged to discharge their cargoes by means of boats and lighters, a method which is very precarious on account of the combers and breakers that usually sweep the coast.

The mountains thus far examined are composed of mica-schists and limestone, alternating in layers and beds with each other. They are thin or medium bedded rocks, and strike and trend northeastward and southwestward and dip southeastward at an angle of about 45°. The limestone is bluish gray and comparatively fine grained and more or less well metamorphosed, often becoming a crystalline marble. The mica-schist is sometimes slaty, but it also shows considerable metamorphic action and is garnetiferous. Locally the rocks are sometimes folded and traversed by quartz veins, and veinlets, of both quartz and calcite, with also some iron and copper pyrites. Pyrites are also disseminated sporadically in the schists. The quartz veins and veinlets traversing the rocks are supposed to be the source of the gold. Far back in the mountains granite is said to occur, but may be represented merely by granitoid dikes, some pebbles of which occur in the beach gravels.

The tundra is composed of apparently marine gravels, derived from the rocks in the mountains, and is almost exclusively mica-

schist and limestone. Toward the mountains the gravels are often coarse, carrying boulders of considerable size, but along the beach they have been largely reduced to fine gravel and sand by wave action. It is in this reduced material that the beach gold occurs.

The first discovery of gold in the Nome district was made in September, 1898, when a party of Swedes found it on the creeks and in the gulches; but not until July, 1899, was the discovery of the beach gold made. In the gulches along the edge of the mountains the diggings

BEACH, TUNDRA, AND HILLS — LOOKING NORTHEAST FROM NOME

are coarse gold, the largest nuggets found being about $350 each. Here the gold occurs on the "bed rock" under the creek gravels, which are six or eight feet in thickness.

Along the beach the gold is quite fine, having been reduced by wave action along with the gravel and sand to the size of bird-shot, or even finer. Its occurrence here is for the most part under two or three feet of gravel and sand, on a bottom layer of clay or argillaceous sand, called "bed rock" by the miners. Thin layers of ruby sand interstratified along with the gravel, near the so-called "bed rock," are also

often found to be richly auriferous. Beach diggings have been operated during the past summer and fall for about thirty or more miles, from Cape Nome to near Synrock. Coarse gold is being mined in Anvil, Glacier, Dexter, and Osborne creeks, and along Penny and Cripple rivers. The production of the region for the past season of 1899, as near as can be estimated, amounted to $2,000,000, of which one-half has been produced by the beach. Discovery claim and one below on Anvil Creek produced $225,000, while Snow Gulch, a very

SNAKE RIVER AND NOME, FROM TUNDRA ABOUT ONE MILE WEST OF NOME

small tributary of Glacier Creek, is reported to have yielded over $200,000.

In the gulches the work is carried on by stripping, sluicing, and to some extent by rocking, while on the beach the method of extracting the gold has thus far been almost exclusively by rocking. Here the water used for rocking is generally that of the ocean. In a few cases, however, the sea water has been raised by steam power and sluices constructed along the beach. In the rocker the gold is caught on blankets and to some extent on copper plates coated with mercury.

In many instances, where the supply of copper plate could not equal the demand, the bottom of the rocker was covered by United States silver coin, principally one-dollar pieces, and these coated with the mercury which caught the gold. During the latter part of summer and in the fall it is estimated that an average of 2,000 men were working along the beach, and that they took out an average of about $20 per day per man. In many cases the amount taken out was much greater. The tundra between the beach and the base of the mountains has also been prospected to some extent and has not infrequently yielded from 10 cents to 30 cents per pan. Capital, however, will doubtless be required to handle the tundra with profit; also the benches above referred to in the lower region of the mountains have been found to be auriferous and have largely been staked.

The country about the head of Solomon and Bonanza rivers, 40 miles northwest of Nome, reports good prospects. In the Golofnin Bay country on Fish River and its tributaries coarse gold was taken out during the past summer. On Ophir Creek, one of the chief tributaries, a single claim is said to have yielded $75,000. Prospects have also been reported on the western shore of Norton Bay. Late in the fall it was rumored that gold had been found at Cape York by a native employed in herding the Government reindeer. These rumors have since been more than verified by Captain Jarvis, who visited this region with the U. S. revenue cutter *Bear*, and by a recent number of *The Alaskan Miner*, issued at Juneau, which reports the country rich and that more than nine square miles of it were staked late in November, and early in December. There seems good reason to infer that substantially the entire southern half of this large peninsula, covering more than 8,000 or 10,000 square miles, is gold-bearing and much of it very rich. It lies in the great Yukon gold belt, extending from the Klondike westward, and probably continues across Bering Sea into Siberia. It seems more than probable that the Siberian coast will be visited by enterprising American prospectors before another season has passed.

There is no timber in the Nome district. The nearest approach to it is a scanty growth of very stunted willow or elm along some of the waterways, wholly inadequate for ordinary camping purposes. A growth of moss, which furnishes abundance of food for reindeer, covers the surface except in the upper slopes of the mountains. There is, however, a sufficient growth of grass to sustain horses and cattle during the short summer months. Mr F. V. Coville attributes the absence of timber to the rigors of the Arctic climate.

Prior to the discovery of gold there were a few natives, all Eskimo, scattered along the coast from near Cape Nome northward, and a small village on Sledge Island during the seal-fishing season. At Port Clarence, which has been the headquarters of the United States reindeer industry in Alaska, is a mission with good schools.

The great movement of the white population toward Nome began early in the summer of 1899 and continued until the middle of October, building up a city of over 5,000 people on a previously barren beach. Nearly every boat which descended the Yukon from Dawson and other points on the river was loaded to its fullest capacity with passengers, while many came from the southeastern districts of Alaska and the Pacific coast of the United States. The rapidity in growth of the city of Nome has probably never been precedented, especially in so remote a region. A thousand or more unsuccessful prospectors descending from the Koyukuk district and an equal number from the Kotzebue Sound and Kowak River district arrived at St Michael in a financially stranded condition; but hearing of the diggings of Nome a majority soon found their way thither, and in a few days' work on the beach had rocked out sufficient gold to place themselves in moderately comfortable circumstances and pay their transportation back to the United States.

The principal trading companies operating at Nome are the N. A. T. & T. Company, the A. C. Company, and the A. E. or Alaska Exploration Company, all with fairly well-stocked warehouses and plants and abundant supplies for next spring. Of newspapers there are at the present time the *Nome News*, *The Nome Gold Digger*, and *The Nome Herald*. *The Nugget*, with printing press and equipments from Dawson, went down in a gale on Norton Sound in September, while a similar outfit bound for Nome from the United States went down on the *Laurado* at St Lawrence Island a few weeks later. A company is now being organized with a view to constructing a deep-water pier for a temporary harbor, to be extended far out into the ocean, whereby deep-sea vessels may be unloaded. Until more definite arrangements can be perfected the United States Post-Office is endeavoring to send the mails to Nome semi-monthly during the present winter by way of White Pass, Yukon River, and the Unilaklik and St Michael route. On account of ice in Bering Sea, Nome cannot be reached by ocean vessels earlier than some time in June, though the Nome coast is free from ice later in the fall and earlier in the summer than the coast about St Michael.

The climate of Cape Nome is mild and for the most part moist or rainy during the summer, but cold and severe in the winter season, which extends from late in October to May. The climate, however, is healthful. During the past summer the only difficulty the population of Nome seemed to encounter was typhoid fever, and this it seems likely would not have occurred with a good drainage system and a wholesome water supply, which may be readily obtained with a little care and labor. Several hospitals were organized and equipped and all did excellent service to their fullest capacity. Other patients were shipped down to the United States in nearly every returning vessel during the latter part of the season.

There are probably about 3,000 people wintering at Nome today, and judging from the present indications it is not unlikely that next summer the population will amount to about 25,000 or 30,000. Living during the past months has been very high—board and lodging, $6 per day, and with room $10 per day. The price of an ordinary meal was from $2 to $3, while wages ranged from $12 to $15 per day. Wood gathered from the drift wood along the beach cost $40 to $50 a cord; coal, $125 per ton, and lumber $125 per thousand feet, and other necessaries almost in proportion.

The population, though considerably mixed, is preëminently American and contains a good business element and law-abiding people. The government is a self-organized municipal government, giving good order throughout. A police force is on duty and there is also located here a detachment of United States soldiers under Lieutenant Creigie, who did much in the earlier stages of Nome toward the preservation of order and the securing of individual rights.

THE IDAHO AND MONTANA BOUNDARY LINE

By Richard U. Goode,

United States Geological Survey

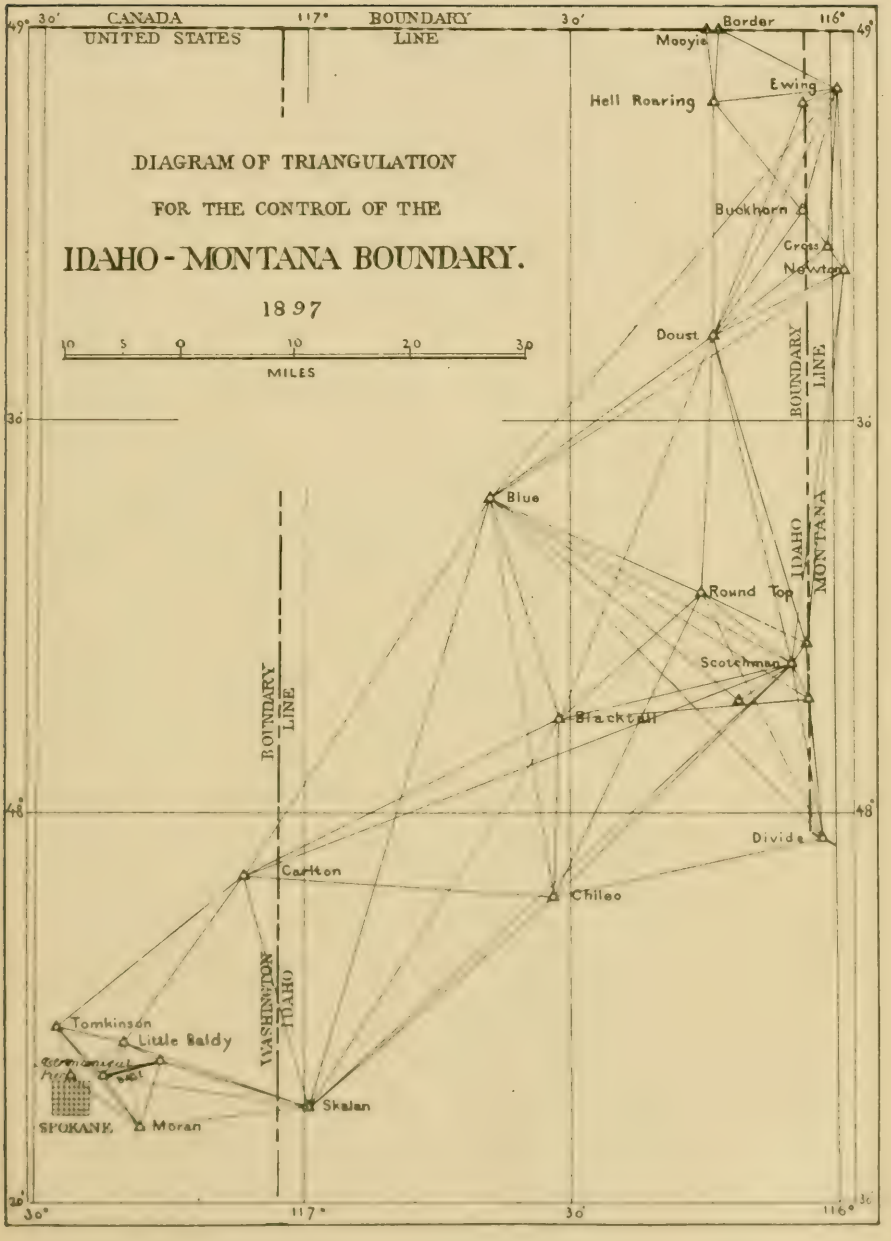
The United States Geological Survey has completed the survey and marking of the portion of the boundary line between Idaho and Montana corresponding to the 39th meridian west from Washington, or 116° 03′ 02.30″ west from Greenwich. The remaining portion of the boundary line follows the crest of the Bitter Root and Rocky Mountains, and as this crest is for the most part sharp and well-defined

(see illustration, page 26), it was not considered necessary to place monuments along this portion of the line, nor would it have been possible to do so under the appropriation, as the available funds were exhausted on the part of the line first mentioned. From a geological standpoint, but hardly from a practical one, however, there is another reason why monuments should not be placed on the summit of the Bitter Root Range* as marking the boundary line between Idaho and Montana. There is abundant evidence that the summit is what is known as a retreating or migrating divide; in other words, the waters tributary to the Bitter Root River in Montana are continually capturing by erosion those of the Clearwater River in Idaho, so that the divide is slowly being shifted to the westward, thus adding to the territory of Montana and diminishing that of Idaho. The existing divide is uniformly from six to eight miles from the irregular line representing the original divide, if the latter may be accepted as having passed through the highest points of the range, which seems probable.

Points near the meridian line were located by triangulation from the Spokane base of the U. S. Geological Survey, this base being referred for its initial latitude and longitude to two astronomic piers in the court-house grounds at Spokane, the latitude determination having been made by the U. S. Geological Survey and the longitude determination by the U. S. Coast and Geodetic Survey.

After the point on the crest of the Bitter Root Mountains corresponding to its intersection with the 39th meridian had been located, this location having been determined by traverse from the triangulation station divide (see diagram of triangulation on page 25), a random line was run northward to the international boundary by transit and stadia, horizontal and vertical distances being measured. Direction was controlled by frequent observations for azimuth. The line was further checked in azimuth, as well as in distance, by connection with the triangulation at four points. It was not practicable to establish a triangulation station near the line at its intersection with the international boundary, so from the most northerly location by triangu-

*There has been considerable discussion as to just what constitutes the Bitter Root Range. The law defining the boundary line between Idaho and Montana implies that the range extends at least from Lake Pend d'Oreille to the Continental Divide, and it seems to the writer, as well as to others interested, that this designation should stand. There are, however, topographic and geologic considerations which make it desirable to differentiate somewhat, and it is proposed that the Bitter Root Range be subdesignated as follows: The Cœur d'Alène Mountains, extending from the vicinity of Lake Pend d'Oreille to St Regis Pass; the St Regis Mountains, extending from St Regis Pass to Lolo Pass; the Lolo Mountains, extending from Lolo Pass to Nez Perces Pass, and the Nez Perces Mountains, extending from Nez Perces Pass to the Continental Divide.


CANADA
UNITED STATES
BOUNDARY LINE
49° 30'
117°
30'
116°
Border
Mooyie
Hell Roaring
Ewing
Buckhorn
Cross
Nowlan
Doust
BOUNDARY LINE
DIAGRAM OF TRIANGULATION
FOR THE CONTROL OF THE
IDAHO - MONTANA BOUNDARY.
1897
10 5 0 10 20 30
MILES
Blue
IDAHO
MONTANA
Round Top
Scotchman
Blacktail
Divide
Carlton
Chilco
WASHINGTON
IDAHO
Tomkinson
Little Baldy
SPOKANE
Moran
Skalan
48°
30'
117°
116°

SUMMIT OF BITTER ROOT RANGE LOOKING NORTH FROM WARD PEAK

The crest of the Range is the boundary line between Idaho and Montana

lation the distance to this point of intersection was measured with a steel tape and was also checked by stadia.

It may be noted that no monuments were found marking the international boundary near the point of its intersection with the Idaho-Montana boundary line, and it is believed that there are large sections of this important line which are not marked and have never been marked in any way. Considerable work was done by the Northwestern Boundary Survey, but just how far this work proceeded is not known. The State Department, in answer to an inquiry on the subject, makes the statement that "The department has no report of the western portion of the Northwestern Boundary Survey from the Pacific Coast to the summit of the Rocky Mountains." It is suggested that under these circumstances a commission similar to the one which recently served in connection with the survey and remarking of the boundary line between the United States and Mexico west of the Rio Grande might be appropriately appointed. There was found, however, among the records of the Northwestern Boundary Survey, in the manuscript-room of the State Department, a list of positions determined, and in this list was given the position of the Mooyie Trail monument, as follows: Latitude, 49° 00′ 01.3″; longitude, 116° 14′ 59.2″. This monument was identified on the ground about eight and one-half miles west of the Idaho-Montana boundary line, and its position determined by triangulation with reference to the Spokane base and astronomic position as follows: Latitude, 49° 00′ 01.51″; longitude, 116° 14′ 19.48″. The check in latitude, 21 feet, was considered very satisfactory, and even the discrepancy in longitude, about 2,647 feet, was not more than might be expected, considering the lack of telegraphic facilities by the Northwestern Boundary Survey.

The point determined as the true one for the intersection of the international boundary and the Idaho-Montana boundary was located with reference to the latitude of the Mooyie monument, so that there may be no discrepancy when the international boundary is ultimately traced and marked, it being assumed that the work already done by the Northwestern Boundary Survey will be accepted and utilized. The random line northward having been run, as previously stated, and the adjustments having been made connecting the line with the triangulation, the true line was then established from north to south and the monuments were placed.

The line going northward starts at an elevation of about 4,850 feet and, descending from the summit of the Bitter Root Mountains, crosses

the Clark Fork of the Columbia at an altitude of about 2,220 feet, then climbs to the summit of the Cabinet Mountains, reaching at this point an elevation of 6,670 feet. Continuing from this locality, it intersects many canyons tributary to the Kootenai River and crosses the latter, touching the platform of the station-house at Leonia, a station on the Great Northern Railroad, at an elevation of 1,824 feet; thence it ascends another high ridge, the Yak Mountain, reaching an altitude of 6,585 feet, whence there is a gradual descent, crossing, however, many lateral streams to the international boundary, at which point the elevation is about 4,500 feet. The country traversed is extensively trenched with canyons of considerable depth, and the sides of the mountains are in many places very precipitous. The profile shows a total rise and fall of about 63,000 feet. The line is for the most part through a heavily timbered country, and there are few roads or trails, so that the question of transportation was a rather difficult one. The length of the line surveyed passes through a latitudinal interval of 1° 1′ 24.65″, or about 70½ miles.

Previous to the work herein referred to, no attempt had ever been made to locate and mark the Idaho-Montana boundary line, but the Northern Pacific and Great Northern Railways had estimated the points at which it crossed their line and established marks according to this estimation. The accepted crossing on the Northern Pacific was found to be about one-quarter of a mile west of the true line, and that of the Great Northern about one mile east of the true line, along the railway line, but only about one-half mile east thereof in direct longitude. Kootenai County, Idaho, spent a considerable sum of money in grading a road up the mountain from Leonia toward Sylvanite, which, when the boundary line was located soon after, was found to be in Flathead County, Montana.

The monuments used along the meridional portion of the line are of two kinds, stone and iron. The stone monuments are of granite, six feet in length and ten inches square, undressed, except for spaces sufficient to permit of the cutting of the words "Idaho" and "Montana" on opposite sides. These monuments are placed in the more prominent localities and are monolithic in all cases when it was possible to transport them in one mass to the proper position; otherwise they were cut in ten sections, so that they could be carried on pack mules, and were bolted and cemented together when established in place. The monuments at the international boundary and at the summit of the Bitter Root Mountains (these being the terminal points

of the meridional portion of the line) are of stone made from sections as described, and monoliths are placed near the points at which the boundary line crosses the Northern Pacific and Great Northern Railways. The iron monuments are hollow posts of wrought iron, six feet in length and about four inches in outer diameter, covered with a coat of asphaltum tar. They were flared at the bottom to a width of 12 inches, so that they might be more securely planted in the ground. These posts are set to a depth of three feet below the surface of the ground, three feet remaining above ground, and a conical mound of earth is raised around them to a height of two feet. On the tops of the posts are riveted bronze caps, on which is cast appropriate lettering, and the number of the monument and the distance from the international boundary in miles are stamped in large figures. In addition to the four stone monuments referred to above, 89 iron monuments were placed. The sites for the monuments were chosen with reference to the topographic features of the country instead of being placed at even miles, as has usually been the custom on boundary lines, but there are no intervals greater than a mile between monuments. They were placed generally on summits or near streams, roads, or trails. Between the monuments the line is thoroughly cut out and adjacent trees are blazed, so that the line can be readily recognized in any locality.

THE COPPER RIVER DELTA

The entrance to the Copper River has become, within the past few years, a region of great interest and importance, and in order to develop its geography a Coast and Geodetic Survey party has been sent there for the past two seasons. Landing in the vicinity of Orca, Mr H. P. Ritter, under whose direction the operations were conducted, immediately began a triangulation of the surrounding country. His party consisted of Mr E. B. Latham and Mr H. C. Denson, both of the Coast and Geodetic Survey, with a foreman and eight hands. The following information has been taken from the reports of Messrs Ritter and Denson, which have just reached Washington.

Astronomical observations were made at several points, notably at Orca and at Kokinhenic. The work comprised a survey of the delta and its vicinity, roughly embracing about 1,000 square miles. The triangulation, of which the base was in the vicinity of Kokinhenic

astronomical station, covers the entire delta, and many observations were taken on the mountains lying to the east, north, and west. This work served to locate their position and determine their heights.

Hydrographic examinations were made at the mouth of the river and at other places. The plane-table work covered the shore-line, positions of sloughs, reefs, etc., and the tidal observations were used in reducing the hydrographic work. Meteorological observations were also made, as well as magnetic observations, at Orca and at a point in the middle of the delta. A large part of the topography was executed by application of the photo-topographic method. A map on a scale of 1 : 80000 was prepared from the results of the season's work.

The longitude depends on the transportation of chronometers, determining a sea rate from observations at San Francisco and Seattle and a land rate after having carried the chronometer ashore and made sufficient observations for this purpose.

Tidal observations were carried on at all stations occupied by the party, namely, Orca, Kokinhenic, Pete Dahl Slough, and Eyak River. These observations were made in such a way that the series for consecutive stations overlap, thus fixing the relation between the tides at the two stations.

At both Orca and Kokinhenic magnetic observations were made—at the former place in May and at the latter in June.

The photo-topographic camera was continually used, and the necessary developing accessories were carried along, so that the negatives were largely developed in the field. Owing to the general unfavorableness of the weather, no systematic scheme could be carried out, although a large amount of valuable data was obtained. One hundred and eighty views were taken with the topographic camera and 88 with an ordinary view camera.

The country in the vicinity of the mouth of the Copper River, as seen when approaching it from the sea, has the appearance of a vast snow-peaked mountain range whose tops are covered with perpetual snow. Innumerable glaciers move down the mountain sides and fill the deeply cut canyons. From the head of the delta to the ocean reef is a distance of about 25 miles. The delta is 50 miles wide, and the mountains range from 1,000 to 8,000 feet in elevation. The flats at the mouth of the river are cut up into numerous islands by the many tidal sloughs and small streams flowing from the glaciers. Many interesting features may be noted in regard to this particular locality, among which may be mentioned the violent winds, which begin dur-

ing the month of September and last through the winter until early spring. They are of such violence that it is impossible for any one to cross the delta while they prevail.

The body of water intervening between the flats and the ocean reefs is navigable to boats drawing from three to four feet of water, and is in places navigable to these only at high tide. By the receding tide an area of about 250 square miles is completely drained, and the surface presents one unbroken expanse of mud. The currents during the rising tide are extremely swift, as the ocean reef acts as a barrier until the water rises over it, when it flows in with great rapidity. The average temperature of the delta during the months of June, July, and August was found to be about 50° F. During the month of September it is 10° less, accompanied by freezing weather during the nights. The vegetation is very marked. On the flats are found flowers and marsh grass; on the sand dunes are alders, berry bushes, and cottonwood trees, while on the mountain side hemlock and firs grow in abundance.

From the head of the delta to where the river leaves the marsh and spreads out over the mud flats it flows nearly south, is about five miles wide, and consists of numerous changeable channels, varying in depth from five to twenty feet. The river breaks through the mountain range about 30 miles from the coast, and is here flanked on the east side by Miles Glacier and on the west by Childs Glacier. In this vicinity are the rapids, which form an insurmountable barrier to all kinds of upstream navigation except canoes.

The most westerly branch of the delta is known as the Alaganik Slough, being the most extensively traveled and important branch of the river. Its length is about 15 miles, and it varies in width from one half mile to one mile, with depths from five to fifteen feet, depending on the stage of the tide. This branch is a tidal stream. The average tide at the lower end during the stay of Mr Ritter's party was about ten feet, while at Alaganik, at the upper end, the tide was from two to three feet. The navigation of this branch is facilitated by the fact that during flood-tide the direction of the current is east, while at ebb-tide it is west. This effect is felt as far as Alaganik.

On the Copper River delta are two large canneries, one at Orca and the other at Odiak. The fishing season begins about May and ends with July. During this time each cannery turns out about 30,000 cases.

E. D. Preston.

OUR NEW POSSESSIONS AND THE INTEREST THEY ARE EXCITING

The intense interest which is felt throughout the United States regarding the islands which the events of the past year have brought into closer relations with us is indicated in many ways, but especially in the large number of inquiries which are being received by the various departments of the government for information along these lines. Two editions of the monograph, "Cuba, Puerto Rico, the Hawaiian, Philippine, and Samoan Islands," issued by the Bureau of Statistics of the Treasury Department, have been entirely exhausted, and a third edition, containing much additional information received from government officials in those islands, as well as from other sources, has just been issued and the statistics of their commerce brought down to the latest possible date. The study of this latest information regarding these islands leads the Bureau of Statistics to the conclusion that their present consuming power is, in round terms, one hundred million dollars—about equally divided between agricultural products and manufactures, but that this can and will be greatly increased by the introduction of modern methods of production and by the creation of roads and railways by which the uncultivated area can be opened, consuming power being dependent upon producing power. Only about two millions of the thirty-five million acres composing the Island of Cuba have, it is estimated, ever been under cultivation, and a considerable percentage of this is now uncultivated, owing to the devastation of the recent wars. In Puerto Rico, while there is already a dense population, the productive capacity of the island can, it is believed, be greatly increased by the construction of railways and roads in the interior of the island, which has now few wagon roads at any distance from the coast capable of use for transporting agricultural products. In the Philippine Islands conditions are quite similar, and the introduction of railways and wagon roads would enable the cultivation of large areas of extremely productive land, which have not up to this time been brought under cultivation. In the Hawaiian Islands a considerable increase is being made in the productive area by irrigation from artesian wells. In the Samoan Islands, which are also discussed, the cultivable area is comparatively small, and especially so in the single island of Tutuila, which falls to the United

States under the new treaty between Great Britain, Germany, and the United States, the chief value of this island being its harbor, which is undoubtedly the finest island harbor in the South Pacific and perhaps of the entire Pacific Ocean.

All the products of these islands are of a class which the United States is constantly required to import in great quantities. The annual importation of tropical products into the United States averages fully $250,000,000 in value, and as this large importation is composed chiefly of sugar, coffee, fruits and nuts, fibers, spices, drugs, dye and cabinet woods, and other tropical growths, all of which can be produced and are now being produced, in greater or less quantities, in these islands, it seems probable that their new relations with the United States may lead to the expenditure in them of most of the money which our people are compelled to send abroad for tropical products, and that in return we shall furnish them the increased supplies of foodstuffs and manufactures which their increased earnings will lead them to demand.

O. P. Austin.

THE TOTAL ECLIPSE OF THE SUN, MAY 28, 1900

The path of the shadow of the approaching total eclipse of the sun, May 28, 1900, begins at sunrise over the Pacific Ocean, just to the west of Mexico, extends thence northeastward over the Southern States from New Orleans, La., to Norfolk, Va., crosses the middle portions of the North Atlantic Ocean to Portugal, and terminates near the northern end of the Red Sea at sunset. The location of this track in the United States is remarkable for its convenient accessibility to a multitude of people, who with a minimum of trouble can easily view the wonderful phenomenon of the solar corona. The track passes over New Orleans, La., centrally, touches Mobile, Ala., on the southern and Montgomery, Ala., on the northern edge, passes just to the north of Columbus, Macon, Milledgeville, and Augusta, Ga., a few miles south of Atlanta, Ga., a little north of Columbia, S. C., just south of Charlotte, N. C., and quite centrally over Raleigh, N. C., and Norfolk, Va. It is easily computed that more than half a million persons will see the total eclipse, of more or less duration, from their homes, and it is not unlikely that many more will take advantage of the opportunity to see the event of a lifetime. Educators ought to encourage their students to go to the track at some point of it, and thus arouse in them a prac-

tical interest in solar physics; transportation companies should find an opportunity, quite equal to an exposition, a yacht race, or a grand parade, of enticing many to make such an excursion. The fact that the track, instead of falling on the inaccessible places of the earth, is so near to suitable hotel accommodations will make the event one of unusual popularity in the United States.

The U. S. Weather Bureau has been conducting a cloud survey of the region near the track during the seasons of 1897, 1898, and 1899, with the object of determining the localities which have the least tendency to cloudiness at that time of the year. The result is that near the Atlantic Coast and extending back into North Carolina the prevailing cloudiness at the morning hour of the eclipse, 8 a. m. to 9 a. m., is about 40 per cent. In the states of Georgia and Alabama the percentage falls to less than 20 per cent. Near the Gulf of Mexico, in Mississippi and Louisiana, it rises again to more than 30 per cent. Hence it follows that the chances for fair weather are about twice as good in Georgia and Alabama—that is, on the highland of the southern end of the Appalachian system—as near the coast in either direction. Unfortunately the duration of the totality on the central line increases from 1 minute 13 seconds near New Orleans, La., to 1 minute 42 seconds near Norfolk, Va., so that astronomers would naturally select stations as near the Atlantic Coast as possible, in order to secure the longest look at the corona. Since the probability of cloudiness is a maximum at the very part of the track where the duration of the eclipse is greatest, there must be some balancing of chances in selecting the sites of the observing stations.

F. H. Bigelow.

THE CENSUS OF 1900

By Dr F. H. Wines,

Assistant Director of the Census

The census impresses the imagination of the American people as something vast and mysterious simply because of the magnitude of the numbers with which it deals and the extent of territory which it covers. The elements that go to make up a census are very few and very simple. The whole subject divides itself into two parts, collection of data and handling of data collected.

The census act prescribes what inquiries shall be undertaken and, in large part, what questions shall be asked. These questions are asked of every individual, of every owner of a farm, and of every manufacturer in the United States, all of whom are required to answer under penalty of law, and are liable to prosecution if false answers are given. For this purpose a small army of investigators is essential, numbering in the aggregate fifty thousand people. The country is divided into three hundred districts, each of which is put under the control of a supervisor, and for each subdivision an enumerator is appointed, who is expected to make a return for from 2,000 to 4,000 of population. The statistics of manufactures are severally collected by special agents. The enumerators are all required to complete their work in thirty days from June 1, 1900, while more time is given to collectors of statistics of manufactures. All these facts are reported on schedules, which constitute what may be called the raw material with which the Census Office has to deal.

Second, the Census Office itself may be regarded as a great manufacturing establishment in which this raw material is collected into printed books. Referring only to the population, it may be said that this conversion involves four distinct processes. In the first of these the facts recorded on the schedules are transferred to cards, one card for every individual enumerated, in which holes are punched according to various possible answers to questions contained in the schedule. There are on each card two hundred and forty distinct positions which any particular hole may occupy. The position of the hole shows its significance. The second process is that in which these cards are counted by electricity. The electrical counting-machine used in the last census is the invention of Herman Hollerith. It is so contrived that needles passing through the punched holes on each card form electrical connections which operate clock-faced dials, showing numbers corresponding to each individual fact or combination of facts. The third process consists in entering the number on result slips and combining them in tabular form as copy for the printer. The final process is the setting-up of the type and the preparation of the stereotyped plates for the press.

All this is very simple in theory and in practice, but it involves an enormous amount of work. The work done in the last census was equivalent to between 6,000 and 7,000 years for one man. The weight of the cards used was 200 tons, and of the schedules returned by the enumerators 150 tons. There is not a day during the continua-

tion of the census work in which it is not necessary to handle four or five tons of paper, while the number of clerks and other employés in the office is about 3,000. To organize and govern a force like this, for the most part untrained and collected almost at hazard from the general population, requires far more than ordinary intellectual and executive ability. The census act directs that this immense undertaking shall be completed in its main outlines by the 1st of July, 1902, or a little more than two years from the taking of the census. It may be doubted whether Congress knew what is implied in this requirement, but the Director and his assistants are determined to comply with it if possible. In order so to do certain conditions are essential, namely, a sufficient number of clerks, competent clerks, a proper house in which to carry on the work, and non-interference on the part of Senators and Congressmen with the government and discipline of the office. A building in which each of the above processes will be conducted in a single room on the ground floor, lighted by skylights in the roof, has been constructed in a convenient location for the especial use of the Census.

GEOGRAPHIC NOMENCLATURE

Mr R. T. Hill's discussion of "Porto Rico or Puerto Rico" raises a question which should be settled on a rational and permanent basis as quickly as possible, before the usage of tourists, newspapers and their reporters is more widely claimed as making precedent and constituting authority in the spelling and pronunciation of the geographical names of the countries that have lately come under the United States flag.

Mr Hill, whose excellent volume on the West Indies could scarcely have been written without a competent knowledge of the Spanish language, can hardly be serious in alleging that "Puerto" is unphonetic and unpronounceable by English-speaking lips. Still less seriously can he believe that the rules of the Geographic Board are intended to imply the adoption by all nations, untranslated, of such politically significant and often temporary compound names as "The United States," any more than they would require the German Empire to be called "Das Deutsche Reich" in this country. That the supposed difficulty is largely imaginary is plainly shown by the fact that in California far more troublesome names than "Puerto" are spelled as in Spanish, and are yet correctly pronounced by all but newcomers to the State. That during the late war the popular pronunciation of Santiago and San Diego was almost identical merely proves the great need of reform in English spelling; it certainly does not argue either that we should adopt the mistake or change the spelling of either name.

Long before there was a Board on Geographic Names the American missionaries in the Hawaiian Islands solved in a simple and sensible fashion the almost insuperable difficulty of spelling the native names and language so as to have them correctly pronounced by English-speaking people and the world at large. They simply adopted for the vowel sounds the letters consistently representing them in the Spanish, Italian, and German (and Sanscrit) languages, which are also current in the Orient in the case of the *lingua franca;* although this has been disregarded by the English in India, and has thus given rise to endless mispronunciations of the geographical names of that country. The question now before us is whether we are to repeat this blunder in our new possessions instead of adopting the sensible expedient of the New England missionaries above referred to, thus gradually working toward a popular understanding of phonetic spelling. We might then hope to get rid, by degrees, of the present orthography (or rather kakography) of the English language. Those who fondly hope to see English become the world-language can hardly expect to realize their dream so long as the present inconsistent spelling is continued; since it not only constitutes an obstacle to the learning of the language by foreigners, but wastes an enormous amount of precious time in our schools in spelling exercises whose intrinsic educational value is about equaled by that of the interconversion of mediæval weights, measures, and coins that so long constituted a favorite and long-protracted theme in our school arithmetics.

With the necessity of more language study in our schools, in order to conform to the requirements of the new territorial acquisitions and of Pan-American commerce as well, our people will soon use their practical common sense with good effect upon these questions, and will find that what has been possible in California and Hawaii can as well be done by the nation as a whole, even if our British brethren should persist in further mutilating the geographical names of their possessions. I trust that whether in the future we write and say Porto Rico (Portuguese) or Puerto Rico (Spanish), the policy of the Geographic Board to conserve to the utmost extent possible the native pronunciation and spelling of names will be maintained as the only means of avoiding the most dismal and discreditable medley on our maps and in our official documents, and the indefinite aggravation of the evil which unprogressive jingoism, whether English or American, would impose upon ourselves, and especially upon posterity.

E. W. Hilgard.

University of California.

PUERTO RICO, NOT PORTO RICO

The controversy over the name of this island has been brought to a highly satisfactory termination by the President of the United States, who has decided that the official spelling shall be *Puerto* Rico, on the ground that that is the form in use "by the people of the island themselves." This decision was rendered in response to a letter addressed to the President by the Chairman of the U. S. Board on Geographic Names, in which reference was made to the embarrassment arising from the non-uniformity of spelling prevailing in the executive

departments. The President's decision is gratifying not only as the final settlement of a question into the discussion of which an astonishing amount of feeling and even some misrepresentation have been imported, but also and especially for the reason that it is founded specifically upon the fact that Puerto Rico is the form in local use, thus sustaining that important feature of the policy of the board which makes local usage the principal factor in the determination of the official spelling of geographic names by the government of the United States. That the official form will speedily come into general use can scarcely be doubted. That rich legacy of Spanish names, so euphonious and so full of meaning, which constitutes a large part of the geographic nomenclature of California and the states and territories of the southwest, has been accepted by the American people without question, as have also the Indian names so common in many parts of the country. There is no demand for nor tendency toward the simplification of names far more difficult, both as to spelling and pronunciation, than Puerto Rico, and the proper spelling of the name of our new island possession will undoubtedly commend itself to the country at large.

J. H.

GEOGRAPHIC LITERATURE

Hawaiian America: Something of its History, Resources, and Prospects. By Caspar Whitney. Pp. 357, with maps and illustrations. New York and London: Harper & Bros. 1899.

This is a history of the islands and a description of their present industrial, social, and political condition, written in an easy, entertaining style, and profusely illustrated with admirable half-tone cuts. It contains five maps, four of which are somewhat detailed charts of the islands. H. G.

The New-born Cuba. By Franklin Matthews. Pp. 389. New York and London: Harper & Bros. 1899.

This is the story of the early stages of reconstruction in Cuba, a page of history not yet a year old. It tells of the installation and working of the military government, of the sanitation of the towns, the relief of the starving, and the attitude of the people toward the future. The author sums up his conclusions at the end of the preface as follows: "Cuba's future, it is safe to predict, will reveal and justify the wise and beneficent acts of the American officials during the most critical part of American occupation, namely, its beginning and early growth. . . . Whatever may be the result of later complications, American occupation of Cuba assuredly was started right." The book is beautifully illustrated with half-tone cuts. H. G.

Practical Exercises in Elementary Meteorology. By Robert DeCourcy Ward, Instructor in Climatology in Harvard University. Pp. xiii + 199. Boston: Ginn & Company. 1899. $1.25.

The especial attention of teachers should be called to this important publication, which is simply a manual for their guidance in teaching meteorology in high schools and academies. It is, in fact, an orderly publication of the many

results of the wide experience of Professor Wm. M. Davis and Mr Ward in teaching meteorology during the past fifteen years at Harvard University. It may even be described as the natural outcome of the methods of teaching this subject that the present writer inaugurated in 1881–'82 for the guidance of the pupils of the Normal School at Washington. Our ideas with regard to education, in meteorology as in every other branch of science, have now come to agree on one fundamental principle, viz., that personal experience, laboratory practice, and individual work are infinitely superior as methods of instruction to the old-fashioned study of text-books. School boards and parents must demand and teachers must be able to give this higher sort of instruction before it can become common in the schools. To this end Mr Ward's "Practical Exercises" will powerfully contribute.

Mr Ward begins by requiring the pupil (and why not also the teacher?) to keep his own personal record of the weather. At first no instruments are to be used, but afterward the thermometer, anemometer, rain-gauge, psychrometer, and barometer are successively introduced; eventually the nephoscope, thermograph, and barograph appear. The use of these instruments of course implies that the observer shall have a general understanding of their methods of action, the errors to which they are subject, and the application of the numerical corrections that are given in the tables also published in Mr Ward's book.

It is not designed or desired that the classes for which this book is written should go very deeply into the complex problems of meteorology. As Mr Ward says, complicated matters should be left to later years. "The teacher who has a fairly good knowledge of one comprehensive modern text book of meteorology will find himself sufficiently well equipped to answer the questions that will be put by the class." The first care of the teacher must be to stimulate good habits of observation and of careful generalization; the search for hidden causes and true explanations must come later. "The interest of a class can easily be kept up throughout a school year by means of a progressive system of observations." The study of the weather should be begun in the lower, if not the lowest, grades of the ordinary grammar school. It is therefore necessary that teachers should have studied the subject previously in their normal schools, a fact that the employés of the Weather Bureau have for twenty years past been constantly emphasizing. Mr Ward believes that the higher instrumental observations, such as the barometer, psychrometer, and nephoscope, may be profitably undertaken in the high school years if not in the last year of the grammar school.

Chapters IV–VII deal with the weather map, its construction and use; chapter IX with the direction of the wind in its relation to the gradient of pressure, and chapter X with the velocity of the wind. After this follow the chapters on cyclones and anticyclones, methods of studying the winds, the weather sequences, the temperatures of the air at different heights, the diurnal variation of direction and velocity of wind. Finally, the observation and formation of dew, frost, and clouds completes the book, which is full of good suggestions to both teachers and scholars.

Fortunately, meteorology may be studied in city schools quite as satisfactorily as in the country, as has been abundantly demonstrated by every-day experience in Brooklyn.

The strong point of the present handbook is that it does not attempt to handle difficult scientific problems. It is adapted to every one's capacity, but it requires that the pupil acquire habits of accurate observation and logical reasoning, instead of the inaccurate and illogical processes that so commonly prevail. We believe that it will exert a strong and beneficial influence in the grammar and high schools of the country.

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CORRESPONDENCE

ROYAL SCOTTISH GEOGRAPHICAL SOCIETY, QUEEN STREET,
EDINBURGH, *November 30, 1899.*

The Editor, The National Geographic Magazine, Washington, D. C.

DEAR SIR: In your November number, opposite page 449, you reproduce our map of northwest Canada and southwest Alaska, and this map is adduced as a proof that, "even after the Joint High Commission had been agreed upon, the best informed British cartographers had not become aware of any conflicting claim," referring to the boundary between British territory and Alaska.

First of all, I must admit that the map is very badly printed [in our Magazine]. Nevertheless, if Mr Foster had examined it attentively he would have seen that the pink coloring, representing British territory, extends to the west of the line claimed by the United States; indeed, owing to bad printing, it extends over some of the islands belonging to the United States. Of course, the copy in the NATIONAL GEOGRAPHIC MAGAZINE does not show this, being in black and white only.

We do not discuss at length political questions, but as shown by one or two notes (on page 488, volume xi), we are quite aware of the questions in dispute relating to the boundary and should not publish a map that was erroneous in this respect unless due, as in this case, to bad printing.

Yours very truly,

W. A. TAYLOR,
Acting Editor, The Scottish Geographical Magazine.

THE Russian Government is making preparation for the construction of a new railway from southern European Russia to Turkestan. This will considerably shorten the route from the commercial centers of Russia to Central Asia.

ON October 24 the government of General Castro announced to the representatives of foreign nations its exercise of governmental functions throughout the Republic of Venezuela. It was recognized as a *de facto* government by Great Britain on November 18 and by the United States on November 21.

THE first grain elevator ever constructed in the Netherlands has just been completed at Amsterdam by the municipal government. Its total capacity is from 16,000 to 18,000 metric tons, its maximum receiving capacity 440,920 pounds per hour, and its discharging capacity, on the harbor side, 220,460 pounds per hour.

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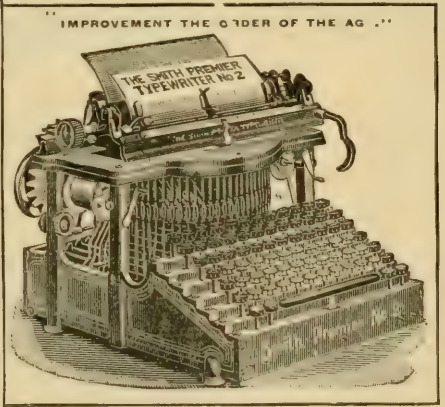

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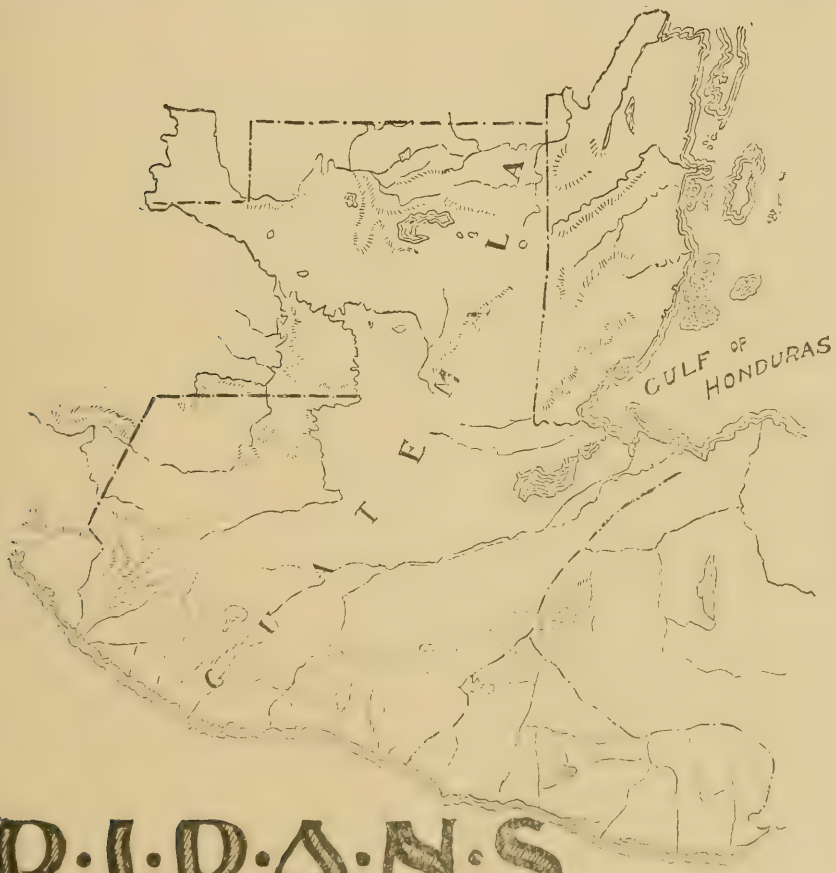

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March 21.*—Austria-Hungary	Professor WILLIAM Z. RIPLEY,	Massachusetts Institute of Technology.
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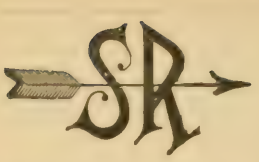
* Prof. Ripley's lecture on Austria-Hungary will be delivered on Wednesday, March 21, at the usual hour.



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The list of contributors to the NATIONAL GEOGRAPHIC MAGAZINE includes nearly every United States citizen whose name has become identified with Arctic exploration, the Bering Sea controversy, the Alaska and Venezuela boundary disputes, or the new commercial and political questions arising from the acquisition of the Philippines.

The following articles will appear in the Magazine within the next few months:

"Russia," by Professor Edwin A. Grosvenor of Amherst College, Massachusetts.

"The Venezuelan Boundary," by Mr Marcus Baker of the Venezuelan Commission.

"The Samoan Islands," by Mr Edwin Morgan, Secretary of the Samoan Commission.

"The Native Tribes of Patagonia," by Mr J. B. Hatcher of Princeton University.

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"Discoveries in the Fossil Fields of Wyoming in 1899," by Prof. Wilbur C. Knight of the University of Wyoming.

"Explorations on the Yangtse-Kiang, China," by Mr Wm. Barclay Parsons, C. E., surveyor of the railway route through the Yangtse-Kiang Valley.

BASALT CANON, PLAINS OF PATAGONIA — SHOWING REMNANT OF A COMPARATIVELY RECENT LAVA FLOW

From a photograph by J. B. Hatcher

THE

NATIONAL GEOGRAPHIC MAGAZINE

VOL. XI FEBRUARY, 1900 No. 2

SOME GEOGRAPHIC FEATURES OF SOUTHERN PATAGONIA, WITH A DISCUSSION OF THEIR ORIGIN

By J. B. HATCHER

Princeton University

In the following pages I shall attempt to describe in as clear and concise a manner as possible the principal geographic features of that part of Patagonia lying beyond the 46th parallel of south latitude as they presented themselves to me during my travels in that country the past three years while engaged chiefly in paleontologic and geologic researches in behalf of Princeton University. I shall also give a brief description of the geology of the region as a basis for a more extended discussion concerning the agencies which have contributed to produce the existing somewhat unusual, not to say unique, drainage systems of Patagonia. I shall not attempt an itinerary of my explorations, in the progress of which I crossed and recrossed the southern extension of the continent in many directions, nor shall I undertake to describe in detail the geography of any particular part of the region.

The attention of the traveler in Patagonia, if he is endowed with any of the instincts of a naturalist, is first attracted to the long line of cliffs that everywhere on the eastern coast rise boldly from the sea to a height of from 300 to 500 feet. While still far out at sea this is discernible to the experienced eye of the navigator, though to the landsman it may appear as a low cloud or fog-bank, to either of which illusions its usually unbroken summit and dull gray colors freely lend themselves. As the vessel approaches some one of the few harbors of this coast, commonly located at the mouths of rivers, its true nature soon becomes apparent, and it develops as a great sea

wall stretching far away on either hand until lost in the northern and southern horizons. This line of bluffs extends throughout the entire eastern coast of Patagonia, with but occasional interruptions at the mouths of the few rivers that, flowing eastward from the Andes across the plains, discharge their waters into the Atlantic.

The rocks forming the cliffs consist of alternating layers of sandstones and clays, approximately though not entirely horizontal, of a prevailing light brown or gray color, and everywhere remarkably free from any faults or other disturbances. Although the color and lithological characters of the rocks are quite similar throughout the entire coast line, yet there is a decided difference in their age and origin, as shown by the fossils contained in them. Toward the north the entire series of strata belong to the Patagonian beds, of Middle Tertiary age and marine origin, and contain in great abundance the fossil remains of oysters, pectins, brachiopods bryozoans, etc., together with occasional bones and skulls of whales, dolphins, and other cetaceans, all bearing unimpeachable evidence as to their marine nature.

These marine beds attain their maximum development in the region of San Julian, where they show a thickness of 900 feet. From this point they dip very gently to the southeast, as is demonstrated by the fact that the succeeding strata gradually disappear beneath the waters of the Atlantic as we proceed southward along the coast. So slight, however, is this southerly dip that for more than 100 miles only the Patagonian beds are seen in the bluffs; but at a point about 40 miles south of the Santa Cruz River a second series of rocks of somewhat lighter color and composed of usually softer materials appear at the summit conformably overlying the Patagonian beds.

This second series of strata constitutes the Santa Cruz beds, of lacustrine and aeolian origin. It contains the remains of that rich and unique assemblage of fossil birds and mammals concerning the age and relations of which there has been such wide discussion. Continuing southward along the coast the rocks of the Santa Cruz beds dip gently to the southeast, so that in the region of Coy Inlet their lowermost strata have reached the water level, while the entire series forming the Patagonian beds are here submerged beneath the waters of the Atlantic.

South of Coy Inlet, as far as Cape Fairweather, the bluffs are entirely composed of the Santa Cruz beds. At Cape Fairweather another series of rocks appears at the summit unconformably overlying the Santa Cruz beds and designated as the Cape Fairweather

beds. They are of marine origin and contain, in great abundance, the remains of marine invertebrates. I should also add that throughout the entire extent of this coast the uppermost crest of the bluffs is composed of from 20 to 30 feet of unstratified boulders and clays, constituting the great Shingle formation of Patagonia, distributed somewhat uniformly over almost the entire surface, and of probably combined ice and aqueous origin.

With this hasty survey of the eastern coast line, let us proceed into the interior. Ascending the bluff we emerge upon a broad, elevated plain, stretching westward to the base of the Andes and abruptly terminated on the east, as we have seen, by the lofty escarpments of the sea. Its surface, with a thin veneer of soil vainly endeavoring to conceal the rocks beneath, is scantily covered with grass. Occasional bushes, seldom attaining a height of more than five or six feet, appear in specially favored localities. Bands of guanaco, or South American camels, and flocks of rheas, the so-called ostrich, feed here in great numbers and provide the chief sustenance of the Patagonian traveler, as also of the Patagonian Indian.

Scattered over the surface of the plains in considerable numbers are great depressions, or rather excavations, frequently several miles in diameter and from 100 to more than 1,000 feet in depth, as observed in some instances near the base of the Andes. The bottoms of these depressions are usually occupied by small saline lakes. In periods of drought, which occur annually in this region, usually from December to April, the volume of water in such lakes is much reduced by evaporation, and beds of almost pure salt are precipitated, occasionally attaining a thickness of several feet.

An examination of the depressions occupied by such lakes reveals the fact that the bluffs on one side are always much lower than those on the other sides, and, further, that the lower side always lies toward the present drainage system of the particular region in which the lake is situated. All this leads to the inference that these are residuary lakes, left as confined bodies of water at the final elevation of the land above sea-level, and, further, that the depressions are remnants of former drainage systems, existing prior to the last submergence, and corresponding approximately, though not entirely, with those of today.

Other features to be noticed are the broad, deep, transverse valleys that cross Patagonia from west to east and form the chief drainage systems. These are all true valleys of erosion, and along their bot-

toms in most cases still flow the streams by which they have been eroded; though in some instances, like the Desire and Coy rivers, there are now only intermittent streams, while in the valley of San Julian no stream at present ever flows, the waters of the original stream having been captured long since at a distance of about 100 miles from the coast by a northern tributary of the Santa Cruz. The latter, considering the volume of its waters, is much the most important of all the rivers of the plains of southern Patagonia.

Another feature characteristic of these plains is the series of escarpments, often several hundred feet in height, that terminate a succession of terraces, encountered at varying elevations as one proceeds from the coast inland westward toward the Andes, or also in crossing from north to south any of the great transverse valleys. Such escarpments have a general trend somewhat parallel with that of the present coast line, but extend inland for many miles along either side of the valleys of all the more important watercourses, as do also the present bluffs of the sea. They are perhaps remnants of bluffs formed along the coast at different stages during the former depression and late elevation of the land, which would appear to have been intermittent and of which we have exhibited in the present bluffs of the sea the last stage. Between each successive escarpment a narrow, level plain extends, gradually increasing in altitude to the westward.

In many places over the plains the sedimentary rocks are covered with sheets of lava, which have usually had their origin in local dikes or volcanoes. Many of the latter rise high above the surrounding plain as imposing landmarks, serving alike to guide the traveler and lend variety to a rather monotonous landscape. These lava fields are most abundant over the central interior region, midway between the Andes and the coast, where they cover thousands of square miles. In some instances they present a broad level surface of almost illimitable expanse, covered with highly vesicular scoriæ, while at other times the surface over large areas is carved into a confusing labyrinth of deep, almost inaccessible, cañons. In either case they present a most serious obstacle to the traveler.

While these lava beds are most frequent over the central interior region, there is an important outlying area near the coast between the mouth of the Gallegos River and the eastern entrance to the Strait of Magellan, with several extinct volcanoes and resulting lava streams, which appear to have been ejected at a comparatively

BASALTIC WALL IN CAÑON OF A TRIBUTARY OF ARROYO GIO — SHOWING FACE DEEPLY DISSECTED BY NARROW, PERPENDICULAR CHASMS

From a photograph by J. B. Hatcher

BASALTIC PINNACLES, PLAINS OF PATAGONIA

From a photograph by J. B. Hatcher

recent date. In some few instances the lavas of the great interior region extend westward quite to the base of the Andes, but as a rule the surface of the plain for a distance of some 30 to 40 miles eastward from the base of the mountains is free from lava. It has either never existed there or has been entirely swept away or covered over by glacial detritus, as has been observed in some few instances.

That region lying between the western border of the lava beds and the foothills of the Andes is by far the most fertile of the Patagonian plains. Its surface, covered to a considerable depth with glacial deposits, presents a series of ranges of low, rounded hills, left as terminal moraines by the receding glaciers. Such ranges of hills have a trend parallel with the base of the mountains, and are usually separated by broad stretches of meadow land, with numerous small glacial lakes, either occupying slight depressions in the meadows or, as more frequently seen, embraced by the low, rounded hillocks of the terminal moraines. These conditions are especially characteristic in this region over the bottoms and slopes of the great transverse valleys, but they extend also in many places out over the surface of the higher pampas.

The rolling surface of this western plains region, abounding in wide pasture lands dotted over with sparkling lakes of pure, sweet water, presents a pleasing contrast to the semi-arid region near the coast, and affords a welcome relief to the traveler after a journey across the black, absolutely barren lava beds of the central plains. Its modest, unobtrusive beauty but emphasizes the grander scenery beyond, indications of which already appear in the distant ranges of the Andes, whose summits, buried deep in fields of snow and ice, are seen brilliantly white against the intensely black background formed by the storm-clouds of the western sky.

Entering the confines of the Andes, numerous rivers, deep rocky cañons, broad open lakes of beautiful clear water, fed by glaciers that descend from the snow-fields at the summits, and all the other features characteristic of an intensely rugged, mountainous region, thrust themselves upon the attention and excite the wonder and admiration of the traveler.

The country lying along and within the foothills of the Andes is in many respects the most interesting region in Patagonia, whether considered geographically or geologically. Taking advantage of any of the numerous valleys that extend westward from the western border of the Patagonian plains and penetrate not only the secondary but also the main range of the Andes, finally emptying into the

Pacific, many facts may be observed not only bearing directly upon the structural and historical geology of the Andes, but also throwing much light on the agencies which have contributed to the peculiar topography and determined the unique position of the continental watershed at present existing in southern South America.

I say unique, for I believe it has no parallel elsewhere. That its true position was quite unknown and entirely unsuspected, even at the beginning of the last decade, is clearly demonstrated by the unfortunate boundary dispute at present existing between Argentina and Chile. This dispute, which even within the last year seriously threatened the peaceful relations of these two South American republics, but is now happily approaching a peaceful settlement through friendly arbitration, arose from an attempt by joint commissions appointed by the two governments to establish and properly mark an international boundary line extending northward from the 52d parallel of south latitude. In their work of delimitation these joint commissions were to be guided by the text of a treaty entered into by the two governments in 1881, which stipulated that a line connecting the highest peaks of the Andes and dividing the waters of the Atlantic from the waters of the Pacific should constitute the international boundary line.

An attempt at a practical application of the conditions of this treaty soon demonstrated its impossibility and developed the fact, previously unsuspected, that the continental watershed throughout the entire extent of Patagonia, excepting only a small area about the source of the Santa Cruz River, was not formed by the main range of the Cordilleras but lay far to the eastward and in many instances extended even beyond the lowermost foothills of the mountains. It was clearly impossible, however good the intentions of the respective commissions might be, to comply with the conditions imposed upon them by a treaty based upon supposed geographical conditions which in reality do not exist, for no line can be drawn complying with the evident intentions and literal conditions of the treaty. But while the joint commissions did little toward tracing the boundary line between their respective domains, yet they have done much to increase our knowledge of the geography of the interior region of central Patagonia, which until the last two years remained almost entirely unknown.

The least frequented, and therefore least known, portion of Patagonia lies between the Santa Cruz River on the south and the 46th

parallel on the north, or approximately between the 46th and 50th parallels of south latitude. I visited this region in the summer of 1896 and 1897, accompanied by Mr O. A. Peterson. At that time neither the Argentine nor the Chilian commission had entered it, the labors of both having been confined to the more easily accessible districts to the north and south. A glance at any of the current maps will demonstrate how little indeed was then known of its interior. The few travelers who had previously visited it contented themselves with a journey up the Santa Cruz River to the lakes about its source, or at most with a trip over the old Indian trail leading from the mouth of the Santa Cruz River up the River Chico to within about 60 miles of the base of the Andes, and thence bearing almost due north over the plains to the head of the Senguer River and down the latter stream to the Chubut, never entering the mountains at any point on their journey. The whole was, at the time of my first visit, practically an entirely unexplored region, abounding in undiscovered and unnamed mountains, lakes, rivers, and glaciers, many of them of great size and exceeding beauty.

In connection with my work it became absolutely necessary to give names to some of the geographic features discovered, especially in my field-notes. Some of these names I afterwards published with sketch maps, showing their location, accompanying preliminary papers relating chiefly to the geology of the region. I endeavored as much as possible to avoid any attempt at a detailed geography of the region, realizing at the time the speedy completion of the infinitely more accurate and detailed geographic work of the Argentine Limit Commission, in charge of Dr F. P. Moreno, to whom more than to any other person we are indebted for all that is at present known of the geography of the interior of southern South America. I am pleased to see that my expectations have already been partially met by the publication in the *Geographical Journal* of a paper read by Dr Moreno before the Royal Geographical Society of London, accompanied by a sketch map giving most of the more important geographic features, and promising a larger map with more details in the near future.

I am not only gratified to see that the few names given by me have been adopted by Dr Moreno, but I am also confirmed as to the wisdom of my forbearance to enter the field of the professional geographer, which might very easily have resulted in a confusing synonymy of important geographic names.

Since Dr Moreno's paper is doubtless easily accessible, I shall not attempt a detailed description of this interesting region, but shall briefly discuss the factors which have contributed to produce the existing unusual drainage conditions. I am the more easily impelled to this course, since some of the theories advanced by Dr Moreno in explanation of certain features described by him appear to me untenable. At any rate, they are not supported by most of the observations made by myself during the past three years.

A study of the southern Andes at any point reveals the fact that they are composed of three distinct, parallel ranges, separated by two deep, narrow, longitudinal valleys. The middle of the three ranges is everywhere much higher than the two lateral ranges and may be reckoned as the principal range of the Andes. The western lateral range is at present partially submerged beneath the Pacific, but is still distinctly seen in the chain of islands extending all along the western coast. The western of the two longitudinal valleys is at present throughout the greater extent of Patagonia entirely submerged beneath the sea and is now represented by the narrow system of rather deep channels that separates the islands from the main land and offers an almost continuously navigable inland waterway extending from the southernmost point of the Brunswick Peninsula to the 42d parallel of south latitude, or throughout more than twelve degrees, a distance of over 700 miles.

The eastern lateral range of the Andes is seen in the foothills that rise somewhat abruptly from the eastern plains to a height in places of some 6,000 or 7,000 feet. They are composed almost entirely of Secondary and Tertiary sedimentary rocks, with occasional layers of intrusive basalts, the whole thrown up in a somewhat complicated system of folds of usually monoclines or anticlines terminating toward the west in a lofty escarpment, the crest of which overlooks the deep, narrow, and irregular, eastern longitudinal valley that separates the eastern lateral range from the central main range of the Andes. In this eastern longitudinal valley there is located a series of the most beautiful mountain lakes, extending northward in a somewhat broken chain from Lake Argentina, at the head of the Santa Cruz River, to the northern limits of Patagonia. At some distance to the south of Lake Argentina the bottom of the valley has not been sufficiently elevated and it is here occupied, not by fresh-water lakes, but by numerous narrow arms of the Pacific, as seen in Last Hope Inlet, Obstruction Sound, Skyring and Otway waters, and Useless Bay, opposite Sandy Point, in the Strait of Magellan.

CAÑON OF RIO TARDE, FOOTHILLS OF ANDES

From a photograph by J. B. Hatcher

In many places important streams enter this great longitudinal valley from the eastern plains and discharge their waters into the lakes, which in turn are emptied into the Pacific through rivers intersecting the main range of the Andes. This is true of all the lakes of this region, with the one noted exception of Lake Argentina and its affluents. The upper courses of the great transverse valleys of Patagonia are always directly opposite some of the larger of these tributary valleys, so that at such places the continental divide is exceedingly low and inconspicuous. This condition, together with certain glacial phenomena, has led Dr Moreno to advance the theory that formerly all the lakes now found in the eastern longitudinal valley discharged their waters into the Atlantic, and that their diversion to the Pacific has been due to the damming of their eastern outlets with glacial drift.

A careful examination of all the facts does not, I think, justify such an assumption. I have examined with considerable care several of the low continental divides about the eastern extremities of some of these lakes, and have never found the original rocks there covered to any considerable depth with glacial detritus. The great terminal moraines left by the former ice-cap could always be seen crossing the transverse valleys some distance to the eastward of the continental divide, where I have observed them to have a thickness of more than 300 feet, as displayed in the bluffs of some of the streams which have cut their way through these moraines in their course to the Atlantic.

A more plausible explanation, it appears to me, is afforded by a consideration of the features at present existing throughout Patagonia and Tierra del Fuego in connection with a proper understanding of the relative land and sea areas that existed there during late Tertiary times, with an appreciation of the greater elevation which has taken place over northern than over southern Patagonia in recent times.

From the present distribution of the rocks forming the marine Patagonian beds we know that during Middle Tertiary times the entire southern extremity of the continent excepting the higher peaks of the Andes was submerged beneath a shallow sea. That this sea was nowhere very deep is shown by the character of the fossils, which are everywhere extremely abundant, and all belong to shallow water and littoral forms. The accumulation of the 900 feet of rocks now forming the Patagonian beds, containing throughout the fossil remains of characteristic shallow-water forms, can only be explained by assuming that this region was undergoing a subsidence sufficiently gradual to

just keep pace with the sedimentation going on over the bottom of the sea. After a time the rate of subsidence became less rapid or ceased entirely, and the shallow sea was gradually converted into a series of estuaries, lakes, and dry lands, in and over which were deposited the Santa Cruz beds of lacustrine and æolian origin. For a long period, extending over late Miocene and early Pliocene times, this region was elevated above the sea. During this long period of late Tertiary elevation the surface of the land was subjected to erosion, and the courses of all the more important valleys and drainage systems now existing were then determined. Toward the close of the Pliocene this entire region was again submerged beneath the sea for a short period, but sufficient for the deposition of the marine Cape Fairweather beds. During this second period of submergence the Andes would appear as a long archipelago of high mountainous islands.

At the close of the Pliocene there began over this region a process of elevation, which, as has been shown, was much more considerable toward the north than in the south. This difference in the amount of elevation accomplished in the northern and southern regions has determined the presence of the series of fresh-water lakes now found in the north in the same relative positions that are occupied farther south by the fiords and inlets from the Pacific. I have obtained absolute proof that this elevation in the north along the Andes has not been less than 5,000 feet, and that it has been much greater in the north than in the south and far greater along the Andes than over the plains.

As this elevation proceeded, each of the transverse valleys, which, as we have already remarked, had their origin previous to the last submergence, would appear successively first as straits connecting the two oceans, and next as valleys, with deep bays along the coast. The Strait of Magellan is the last or most southerly of these great transverse valleys, and still exists as a strait connecting the two oceans.

Turning now to the eastern longitudinal valley, it will be seen that as the elevation progressed it would at first be broken up into a series of fiords and inlets toward the north still communicating with the Pacific through the deeper channels intersecting the main range of the Andes. In time such communications would be severed and the heads and arms of the fiords would be left as lakes to discharge their waters into the Pacific by the last and deepest of the connecting channels. We have thus represented between the Strait of Magellan and

Lake Argentina every stage in the development of the present lake systems of the southern Andes.

A glance at one of Fitzroy's charts of the Magellan Strait instantly reveals the fact that it is much deeper in its western than in its eastern course. In fact, it is extremely shallow throughout its entire course from Useless Bay eastward to Cape Virgin, and only a comparatively slight elevation would here suffice to bring its bottom above sea-level and convert it into a valley connecting Tierra del Fuego with the mainland, and changing Useless Bay first into a fiord, and later into a lake as the elevation increased, sending its waters to the Pacific by way of the much deeper western channels of the straits.

The same conditions that exist today in the Strait of Magellan have existed at some previous time over all the great transverse valleys of Patagonia, and an elevation similar to that which has taken place more to the northward would produce conditions along the course of this strait identical with those now existing farther north. So also an elevation of the region south of Lake Argentina similar to that which has taken place north of this lake would convert Last Hope Inlet, Obstruction Sound, Skyring Water, and Otway Water from marine fiords connecting directly with the Pacific into a series of fresh-water lakes discharging their waters into the same ocean.

At present Otway Water is separated from Cabeza del Mar, a small bay extending inland from the eastern extension of the Magellan Strait, by a narrow neck of land only eight miles in width, and with a maximum altitude of perhaps less than 100 feet. Notwithstanding this low altitude, the low bluffs extending along the heads of both of these bays are largely composed of sedimentary rocks covered over with only a thin layer of glacial detritus, proving conclusively that the former connection that doubtless existed between these two bodies of water has been broken not by a damming up by glacial materials, but by an elevation sufficient to bring the sedimentary rocks at the bottom above the water level.

From the observations and conditions already referred to, and many other facts bearing directly upon these questions, I believe that the longitudinal valleys separating the main range from the two lateral ranges of the Andes, and also the great transverse valleys crossing Patagonia from east to west, had their origin previous to the last submergence, which took place over this region in late Pliocene times and continued only for a relatively short period. This submergence was greater over the western than over the eastern Andes, thus ren-

dering the western channels much deeper than the eastern. Toward the close of the Pliocene there began over this region a process of elevation, which, though general over the entire region, was greatest along a line approximating that of the axis of the eastern lateral range of the Andes, and was also greater over northern than over southern Patagonia. As the elevation proceeded the general surface of the land would be brought above water level, while the longitudinal and transverse valleys would remain submerged and appear respectively as channels from the Pacific and as straits connecting the two oceans. This condition may be termed the first stage in the process of elevation and is now seen in the Magellan Strait.

After a time a second stage would be reached, in which the transverse valleys would no longer appear as straits, but as land valleys, while the channel of the eastern longitudinal valley would be broken up into a series of fiords extending inland from the continuous channels of the deeper western longitudinal valley. This second stage is now seen in the region lying between the Strait of Magellan on the south and Lake Argentina on the north.

A third stage appears when the amount of elevation accomplished is sufficient to sever the connection existing between the east and west longitudinal valleys and reduce the fiords entering the eastern valley to a series of lakes discharging their waters by rivers into the channels of the western valley, still submerged beneath the sea. This third stage is seen in the region north of Lake Argentina, while a fourth stage, in which the bottom of the western longitudinal valley is brought above water level, appears in extreme northern Patagonia and the region to the northward, where it embraces the principal agricultural lands of Chile.

KITE WORK OF THE WEATHER BUREAU*

By H. C. Frankenfield,

U. S. Weather Bureau

As early as the year 1895, Prof. Willis L. Moore, Chief of the U. S. Weather Bureau, determined to undertake at the earliest practicable moment a study of the meteorological conditions existing in the free air over the United States, the data to be obtained from automatically

recording instruments attached to kites. Independent observations at single stations had been made previously by private individuals, notably those under the direction of Mr A. L. Rotch at Blue Hill Observatory, Mass.; but observations from a single station, while extremely valuable in themselves, are useless when comparative results are sought. It was the hope of the Chief of the Weather Bureau in establishing a chain of kite stations that it would be possible to construct daily synchronous charts of pressure, temperature, and wind velocity from the data thus obtained for different elevations up to at least 5,000 feet, and that from a study of these charts a marked advance could be made in the present system of weather forecasting.

An immense amount of time, labor, and experimentation was necessary before the kite apparatus could be brought to a high state of efficiency, the observers properly instructed, and the stations established, and it was not until the spring of the year 1898 that the work was fairly launched. In all seventeen stations were established, mostly in the great river valleys and the Upper Lake region.

The standard kite used was constructed largely after the Hargrave model, with various improvements suggested by actual trial and experiment. At some stations the kite contained 68 square feet of surface, at others a smaller kite of 45 square feet was used, and at still others a slightly larger one of 72 square feet of surface was occasionally used.

The meteorograph, an instrument for recording automatically the pressure, temperature, and relative humidity of the air, was devised by Prof. C. F. Marvin of the Weather Bureau. The mechanisms were inclosed in a light aluminum case, the whole being suspended within the framework of the kite.

It was soon discovered that the hope of a daily synchronous chart of the conditions existing at high altitudes could not be realized. On many days ascensions were impossible, owing to the absence of sufficient wind to sustain the kites. Neither could they be flown in stormy weather. There were made only 46 per cent of the total number of ascensions which would have been possible had wind and weather conditions been favorable. The percentage varied from 75 at Dodge City, Kans., to 12 at Knoxville, Tenn. When by chance ascensions were made at a majority of the stations on any one day, varying wind conditions necessitated their being made at different hours, thereby

* Summarized from Vertical Gradients of Temperature, Pressure, and Wind Direction: Weather Bureau Bulletin F, U. S. Department of Agriculture.

destroying the synchronism of the observations, without which aërial observations would be of little assistance to the forecaster in his work.

However disappointing the results obtained may have been when viewed from the standpoint of weather forecasting, they were very far from being so from another. An immense amount of data was obtained from the 1,217 ascensions and 3,835 observations, particularly in reference to temperature variations with increase of altitude, and it is believed that our previous knowledge of this subject has been materially increased.

Briefly summarized, the results of the observations were as follows:

There were considered in all 3,835 observations, of which 603 were at 1,000 feet elevation, 906 at 1,500 feet, 928 at 2,000 feet, 746 at 3,000 feet, 423 at 4,000 feet, 182 at 5,000 feet, 38 at 6,000 feet, 7 at 7,000 feet, and 2 at 8,000 feet. Of the two at 8,000 feet, one was obtained at Washington, D. C., and the other at Dodge City, Kans. In the Mississippi Basin, except on the slope of the Rocky Mountains, high ascensions were impossible, as the average wind velocity was but six miles or less per hour.

The mean rate of diminution of temperature, with increase of altitude, was found to be 5 degrees for each 1,000 feet, or only 0.4 degree less than the true adiabatic rate. This is strictly a mean value, obtained from observations taken at all elevations from 1,000 to 8,000 feet, and under varying conditions of weather and at different hours.

The largest gradient, 7.4 degrees per 1,000 feet, was found up to 1,000 feet, and thence up to 5,000 feet there was a steady decrease to 3.8 degrees, the rate of decrease varying inversely with the altitude. Above 5,000 feet there was a tendency toward a slow rise in the gradient, but the lack of a sufficient number of observations above 6,000 feet prevents a positive assertion to this effect. The morning gradients were also greatest up to 1,000 feet, and least up to 5,000 feet, and the rate of decrease was about the same as that of the mean, the curves showing a very close agreement in this respect. The average morning gradient was 4.8 degrees per 1,000 feet.

The afternoon gradients were larger, but not decidedly so, the average value being 5.8 degrees per 1,000 feet. The greatest rate of decrease is still found at 1,000 feet, and the least up to 5,000 feet, if the few observations at 7,000 feet are not given equal weight.

The morning, afternoon, and mean gradients for the different elevations from 1,000 to 8,000 feet are given in the following table:

Decrease of Temperature for Each Respective 1,000 Feet of Altitude

	1,000 feet.	1,500 feet.	2,000 feet.	3,000 feet.	4,000 feet.	5,000 feet.	6,000 feet.	7,000 feet.	8,000 feet.	Mean.
	°	°	°	°	°	°	°	°	°	°
Morning	7.2	5.5	4.8	4.0	3.7	3.7	3.9	3.4	3.0	4.8
Afternoon	7.5	6.4	6.0	5.5	4.9	4.3	4.5	3.5	4.9	5.8
Mean	7.4	5.8	5.2	4.4	4.0	3.8	4.1	3.4	4.0	5.0

A grouping of the stations according to their geographical locations disclosed the fact that the mean rate of temperature decrease with increase of altitude was much greater in the central Mississippi watershed than in the Upper Lake region, the central West, or the extreme East as represented by the single station at Washington. In the afternoon, however, the differences were very small, the maximum being only 0.7 degree per thousand feet.

The morning, afternoon, and mean results for the various districts are shown in the following table:

Gradient per Thousand Feet

District.	Morning.	Afternoon.	Mean.
	°	°	°
Atlantic Coast	3.4	6.0	3.6
Central Mississippi watershed	5.8	6.1	5.8
Upper Lake region	4.5	5.4	4.6
Central West	4.3	5.6	4.7

It will be at once remarked that there is a very close agreement between the means for the Upper Lake region, those for the central West, and the grand mean of 5.0 degrees, as well as a marked deficiency on the Atlantic Coast, amounting to 1.4 degrees per thousand feet.

Negative gradients of temperature, or "inversions," were quite frequent during the morning hours at a number of the stations, and they, of course, bear a direct relation to the amount of cloudiness and the velocity of the wind. At Washington on June 21, 1898, the temperature at an elevation of 866 feet was 14 degrees higher than at the surface, and 10 degrees higher at 1,700 feet. At Dodge City, Kans., on October 23, 1898, there was an inversion of more than 11 degrees at an altitude of over 5,000 feet. As a rule, however, the amount of inversion was less at Dodge City than at Washington on account of the prevailing higher winds at the former place.

The central fact of importance which the study of inversions developed was that they were most pronounced with the radiation of relatively warm southeast to southwest winds, the marked cold at the surface and the higher warm air presenting a marked contrast, which was not so apparent when the upper air blew from a colder northerly direction.

Inversions were sometimes caused by cloud formation in the early morning. Below the clouds there would be little or no temperature change, while above there would be an increase on account of the direct action of the sun's rays. On October 1, 1898, a marked case of this character occurred at Dodge City, there being a rise in temperature of 11.5 degrees within a few minutes after the kite emerged from the upper surface of the clouds.

The most remarkable instances of inversion were found at Duluth, Minn. Nearly one-half of them occurred in the late morning and early afternoon, during cloudy weather, and were due to the easterly surface winds from Lake Superior, the warming effect of these winds being sensible at times to the height of nearly 6,000 feet. During these inversions the direction of the upper air current would be almost or entirely diametrically opposite to that at the surface. On June 3, 1898, there was an inversion of 2 degrees at an elevation of 5,372 feet, and on September 20, 1898, one of 1 degree at an elevation of 5,714 feet.

The effect of the presence of clouds upon the temperature gradient was quite uniform, though not at all times decided. In a great majority of instances there was a decrease in the rate of temperature fall, frequently amounting to a complete arrest, and less frequently to an inversion. After the kite emerged from the clouds the rate of temperature change would be diminished.

In a number of instances the clouds appeared to have no effect whatever, and in a few rare ones there was a fall in the temperature as the kite came in contact with the clouds.

As a rule, the temperature gradients were greater in clear than in cloudy weather, although exceptions were quite numerous.

The relative humidities at and above the surface of the earth differed but little, and, except at 2,000 and 8,000 feet, the upper air percentages were the lower. The mean results obtained from all the observations were 60 per cent at the surface and 58 per cent above, a difference of 2 per cent. There were, however, some marked differences at individual stations, viz., Washington, 14 per cent; Omaha,

Nebr., 29 per cent; Springfield, Ill., 21 per cent, and Fort Smith, Ark., 12 per cent, the surface humidity being the higher, except at Fort Smith. At thirteen out of the entire seventeen stations the difference did not exceed 10 per cent, and at nine stations it was 5 per cent or less.

For obvious reasons, as the altitude increased, the relative humidity decreased whenever the winds were from north to west, particularly from the northwest, and increased with winds from east to south, particularly with those from the east. When the kite was in or near clouds, the humidity would almost invariably rise, falling again when the kite was freed from cloud influence.

Vapor pressures were expressed in percentages obtained by the formula $\frac{p}{p^{\circ}}$, "p" representing the vapor pressure at any given altitude and "p°" that observed simultaneously at the earth's surface. The mean thus obtained was 59 per cent, and there was a steady, though by no means uniform, decrease with increase of altitude. The percentage at 1,500 feet was 82 and at 8,000 feet 44. The decrease was most rapid between 2,000 and 5,000 feet, where it averaged 9 per cent for each 1,000 feet. The lowest percentage, 52, was found at Omaha, Nebr., and the highest, 77, at Pierre, S. Dak.

A comparative statement of kite, balloon, and mountain observations is given below. In determining these results the records of 1,123 kite ascensions were used. There were 4 balloon ascensions by Hammon and 2 by Hazen. It is not known how many observations were made by Hann.

Diminution of Vapor Pressure with Altitude

Value of $\frac{p}{p^{\circ}}$ for each respective 1,000 feet of altitude

Character of observations.	1,500 feet.	2,000 feet.	3,000 feet.	4,000 feet.	5,000 feet.	6,000 feet.	7,000 feet.	8,000 feet.	Mean feet.
Kite	0.82	0.78	0.70	0.61	0.52	0.49	0.39	0.44	0.59
Balloon (Hammon)	0.96	0.96	0.87	0.68	0.44	0.59	.....	.....	0.75
Balloon (Hazen)	0.89	0.83	0.80	0.78	0.67	0.46	0.44	.....	0.70
Balloon (Hann)	0.84	0.80	0.66	0.61	0.60	0.54	0.41	0.37	0.60
Mountain (Hann)	0.83	0.81	0.80	0.66	0.61	0.58	0.55	0.47	0.66

Differences in wind direction were indicated by the changes in the azimuths of the kites. These showed that, as an almost unvarying rule, the general directions above and at the surface were practi-

cally the same, the differences being confined to a deflection toward the right at the kite. This deflection frequently increased with the altitude, but rarely exceeded 90 degrees. In some few instances the kite was deflected toward the left, but not to any great extent. When the deflection was toward the left, the wind velocity decreased with increase of altitude, as shown by the diminished pull on the kite wire. As a matter of interesting coincidence, and without intention of endeavoring to establish a direct relation of cause and effect between the two, it may also be stated that these deflections toward the left were quite frequently followed by thunderstorms within a few hours.

At Duluth, Minn., there were occasionally wide divergencies of the kite toward the left, due to the northeast wind from Lake Superior. This northeast wind was very often purely local, attributable entirely to the influence of the lake, and corresponding in a minor way to the sea breezes of the ocean shores. It developed upon investigation that these local currents were sometimes not more than 700 or 800 feet in depth, and rarely more than 2,000 feet.

Hammon * and McAdie recorded a somewhat similar experience with the westerly surface winds at San Francisco during their kite experiments in 1896, and in his paper on the subject Mr Hammon concluded that the strong westerly surface wind which prevails on the Pacific Coast nearly every afternoon has a depth of only 800 to 2,500 feet.

An extension of the aërial observations to other seacoasts would doubtless prove conclusively that the diurnal sea breezes are extremely shallow.

After November, 1898, all kite stations were closed except that at Pierre, S. Dak., where ascensions were made whenever possible during the year 1899, and still continue. No extended study of the observations made during this time has as yet been made, but a cursory examination of the winter temperature records discloses a condition of affairs radically different from that which prevails during the remaining seasons of the year. The inversions are very frequent and decidedly marked. Indeed they are so persistent during the colder weather as to lead to the inevitable conclusion that during a cold wave the belt of cold air is not much over one mile in height, and often but little over half a mile.

On several days it was also noticed that there were at least three

* Experiments with Kites at San Francisco, Cal., by W. H. Hammon, forecast official. Monthly Weather Review, August, 1896.

distinct air strata within very narrow vertical limits: a lower cold one extending upward about 1,500 feet; a warmer one extending to between 2,500 and 3,000 feet, and then a second cold one of unknown extent.

The entire subject of aërial investigation offers a very attractive field to the student. The work has just begun, and future investigators must certainly bring to light many truths, now concealed, which will prove of the utmost interest and value to themselves, the cause of science, and the world at large.

PRACTICAL EXERCISES IN GEOGRAPHY

By W. M. Davis,

Professor of Physical Geography in Harvard University

The graduate of a high-school course in physical geography cannot be expected to have reached the stage of independent and original investigation in new fields unless he possesses unusual mental capacity, but he ought certainly to be able to recognize the outdoor occurrence of things similar to those that he has studied in school. This would be difficult if he had studied only a book, even if its text gave good presentation of names, definitions, descriptions, and explanations, supplemented by pictures and maps. It is probably for this reason that we find today an essential unanimity regarding the addition of practical exercises in some form to the lessons in physical geography based on a text. The reports made by the several committees of the National Educational Association—the Committee of Ten (1893), Committee of Fifteen (1895), and the Committee on College Entrance Requirements (1899)—all emphasize the importance of observational exercises in field and laboratory; and many progressive schools in which courses of high-school grade in physical geography are given today are doing their best to solve the difficult problems that arise when the attempt is made to put these recommendations into practice.

Attitude of Teachers.—The advantages that come from well-planned field and laboratory exercises in physical geography are so great that the difficulties in their way must be overcome in one way or another. Fortunately there is today no more effective aid toward this end than the desire of the teachers themselves to gain it. This is mani-

fested in many healthy ways. There is the frank recognition by the teachers of deficiencies in their preparation; there are strong efforts to make up the deficiencies by outside study or by attending summer courses in which laboratory work and field excursions are included, and I may say that no classes that I have ever had have shown a better spirit than those composed chiefly of school teachers in the summer vacations. Superintendents and principals manifest the same interest in progress by devoting specially assigned space in new school buildings to work of this kind, by making inquiry as to the necessary outfit, and by planning schedules in which hours for outdoor work have due consideration. Educational journals reflect the general interest in the practical aspects of geography by publishing a good number of articles that are devoted to this branch of the subject; the *Journal of School Geography*, for example, in the thirty numbers issued for 1897, 1898, and 1899, contains many articles bearing on field and laboratory methods, some of them being prepared by the editors in direct response to questions from the subscribers.

Relation of Practical Exercises to Text Book.—It is desirable that the practical work of a course on physical geography in the high school should be closely parallel with the book work, for the reason that the main outline of the subject is best presented definitely and specifically in printed form; but it must be recognized that many obstacles stand in the way of the easy attainment of this ideal. In the first place, exercises on certain subjects must be very deliberately carried on, requiring even a whole school year for their proper inductive development. These must either anticipate the high-school course or they must advance independently of the text in which their equivalent is stated in printed form. The study of the weather finds some of its best applications in observation of storms and other special conditions at the time of their occurrence. These must be taken up in the order of their happening, and reference must then be made forward or back to their systematic treatment. Our climate is such that the open field season comes in the fall and spring, while many topics under the important heading of land forms will often be taught from the book in the winter, when field work is difficult or impossible. Indeed, even in fall and spring, an excursion, well planned to illustrate the text in hand at the moment, may have to be postponed on account of bad weather, thus disorganizing our best intentions. It is true that laboratory work may often supplement or replace field work, but not sufficiently to smooth out all the difficulties noted

above. Simple parallelism between text and practical exercises is therefore out of the question, and we must be content if some effective correlation between the two is gained instead. In order to give specific indication of the character of various practical exercises and of the correlations that may be established between such exercises and book work, let me open the subject with some examples appropriate to the study of that interesting chapter of physical geography which is often given a forbidding appearance under the name of "mathematical geography."

The Earth as a Globe.—It is seldom that justice is done to the opportunity of practical work under the heading of the earth as a globe. The difficulties that stand in the way of various observational exercises may certainly be overcome if their accomplishment rather than the maintenance of a set order of school periods is made the object in view. Many series of observations that cannot and need not be made by a whole class may be made by scholars singly or in pairs; the avoidance of such exercises, because of the disorder that they may create, does not speak well for the discipline or for the spirit of the school. Several of these exercises are best performed under the name of nature study in lower grades than the high school; they are mentioned here because if, as is too often the case, they have not been performed in their proper place they should be given place in the high school; but it is manifest that such a plan disarranges the high-school course in physical geography and retards the attainment of the grade that it deserves.

Shape of the Earth.—The only observational proof of the globular shape of the earth that is within the reach of young scholars is offered at the time of an eclipse of the moon. Such an opportunity should not be lost sight of. The edge of the earth's shadow always having a curved outline, the earth must be round, as Aristotle perceived four centuries before the Christian era. The time-honored proof afforded by the gradual disappearance of ships at sea is available only at the sea-shore; it is interesting to note that this proof was first mentioned by Strabo. Accepting the globular form as a fact, the horizon plane, touching the earth's surface at the observer's station, extends indefinitely on all sides; the visible sky lying above, the invisible sky lying below the plane. As long as the earth is thought of as a large body in comparison to the dimensions of the sky vault, it will probably be more or less consciously believed that the smaller half of the sky is above and the larger part is below the horizon of an observer.

But when the earth is stated to be very small in comparison to the distance to the stars, the two parts of the sky separated by a horizon plane will be recognized as equal. The horizon planes of observers at different points on the earth will cut the sky into different halves, as may be shown by the aid of a hand globe. The uneven border of the sky against hills should be called the sky-line, not the horizon. All this is as much astronomy as geography; but it is all essential to the clear understanding of matters that are constantly taught in geography, such as latitude and the seasons; no safe entrance into such matters can be made without careful attention to fundamental concepts.

The discovery, attributed to Eudoxus, that an observer, traveling north or south, sees that stars change their position with respect to his horizon, will be considered in connection with measures of the size of the earth further on.

The causes and consequences of the earth's shape are better presented in the text than in practical exercises. Among the consequences are the essentially uniform value of gravity at all points on the earth's surface, and the absence of immense ascents and descents that must occur on an earth of any other shape. The nearly globular form of the actual earth has been of enormous importance during long past ages in facilitating the migration of plants and animals from one region to another, and in recent centuries in permitting the migrations of mankind and the development of commerce.

Rotation.—The vague ideas in the minds of adults regarding the earth as a rotating globe suggest that no good ground was provided in their school days for a correct understanding of this fundamental problem. The problem pertains equally to geography and to astronomy; but as it should be encountered before these two subjects are differentiated, it is naturally classified under the first and more usual school subject. Very simple apparatus suffices. A pointer, pivoted at one end and sighted at the sun at different hours through the day, enables a young observer to gain a definite idea of the sun's (apparent) daily movement across the sky. (Actual sighting at the sun is not necessary: when the pointer is held so that its shadow is no larger than its cross-section, it is properly directed.) Record of successive observations may be made by setting up stakes so that their tops shall just touch the end of the pointer in the successive sights at the sun. On the following day the sun may be seen again in the earliest position observed on the first day, the period thus measured being a natural

unit of time which civilized nations divide into 24 hours. It is important to notice that the sun's return to its original position has not been accomplished by going backward, but by continuous motion as if in a circuit. The idea of rotation is thus clearly presented in spite of the fact that much of the sun's diurnal path is out of sight. It should not be understood that these observations give school children their first knowledge of the movement of the sun in the sky; that they have long known. But the vagueness of ordinary knowledge on this point is now advanced to well defined knowledge, and this is an important step.

Regularity in the movement of rotation is easily shown by making observations at regular intervals of one or two hours and noting that equal angles are moved over by the pointer, or that equal arcs are measured between the stake tops in equal time intervals. It is, I believe, well understood by teachers today that no preparatory study of formal geometry is needed as a basis for inspectional geometry of this kind. A little more advanced treatment is given by making observations at irregular periods, noting the time intervals between them, and proving by a continued proportion that angles and times bear a constant ratio. The angle of complete rotation (360°) will be found to bear the same ratio to the time of a complete rotation (24 hours) as that which obtains between partial angles and times; hence the movement of the sun while it is beneath the horizon must be at the same angular velocity as while it is within reach of observation above the horizon. Day-time observations of the old moon (about third quarter) and evening observations of stars at home may be used to extend the results gained from the observations of the sun. If the moon is studied, the teacher should be prepared to explain the questions that may rise if the difference in length of solar and lunar days is detected. The chief point to be determined by star observation is that a star must make a circuit of the sky in about 24 hours, because on the second evening it comes from the eastward to the position from which it departed with a westward motion the night before—an elementary matter truly, but one which is less clearly known to many civilized adults than it was to their barbarous ancestors.

Axis and Meridians.—As a result of these observations it is recognized that "something" must turn. Whether it is the earth or the sky that turns need not be decided at once, if the teacher has the patience to let this archaic problem really take possession of the

pupils' minds. In either case, the fact of turning demands an axis on which the turning shall take place, and if the pupils have any serious difficulty in discovering and stating the attitude of the axis the teacher may be sure that the difficulty lies chiefly in the form of her questions, for the problem is essentially easy to living boys and girls, however difficult it may seem when clothed in words to which they are not accustomed. When the "slanting" attitude of the axis of turning is clearly recognized, all problems of size, latitude, and longitude are greatly simplified. By whatever short-cut the teacher presents the conclusion that the earth and not the sky really turns, the axis must be conceived as passing through the earth's center, and as defining two significant points, the poles, where it "comes out." The discovery of the north pole of the sky near the North star (really more than two moon diameters from it toward the end of the Dipper handle) leads to a clearer understanding of the diurnal paths of the stars in smaller or larger circles.

The shadow cast by a vertical pole on level ground by the midday sun shows us the direction in which one must travel to reach the North Pole. The prolongation of this line around the earth gives a meridian circle. The meridians are standard lines of direction. The equator is the great circle that cuts all the meridians in halves, midway between the poles. A series of meridians drawn at equal distances apart at the equator divide the earth into equal areas, conveniently arranged for measuring the relative easting or westing of places. A small hand globe may be appealed to in this connection, but constant reference should be made to "outdoors" as a part of the real earth on whose surface the imaginary circles are to be traced. "There" on a hand globe is not so useful as "there," pointing out the window toward the equator. The latter may arouse a live sense of directions, always useful in self-orientation, whatever is one's path in life; the former may leave the subject an unreality.

Latitude.—The determination of local solar time and of magnetic variation may be introduced in this connection, but more important is the estimation of one's position on the earth's surface with respect to the pole and equator. No mention of the term "latitude" need be made till this question is solved. It may be solved even in the grammar school by means of the sun-circle, marked out by stake tops, as above described. First, some general considerations. To an observer at the pole the sun or the stars would travel around the sky once a day, in circles parallel to the horizon. The position of the

star circles remains fixed wherever the observer goes and however much his horizon changes from the position that it had at the pole. As the observer moves along any meridian toward the equator his horizon must progressively tilt from the position that it had at the pole; and the amount of tilting may be measured by the angle between the tilted horizon and any one of the star or sun circles. This is, in essence, the method of Eudoxus, already referred to. A third way from pole to equator the angle would be 30°; half way, 45°; two-thirds way, 60°; at the equator, 90°. The rotation of the earth is thus of great assistance in determining the relative positions of places. Bearing these principles in mind, let the sun-circle be determined and represented by a series of stakes in a school yard, as in figure 1. Stand about 30 feet to one side of the stakes, in such a posi-

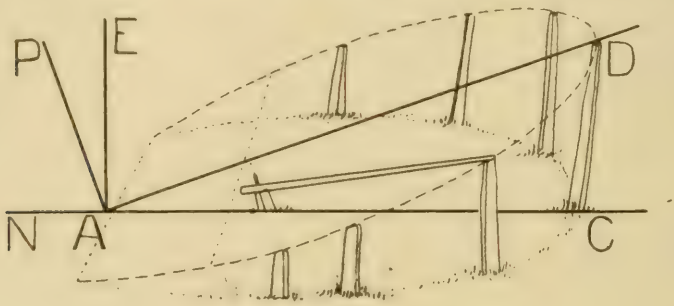

FIGURE 1

tion that the tops of all of them fall into a slanting, straight line when the observer's head is lowered to the height of the highest stake; estimate or measure the angle, CAD, by which the horizon is depressed beneath this slanting line*; and as the angle thus determined is to 90°, so is the distance from the pole (measured along a meridian from the pole to the observer) to the entire quadrant of the meridian from pole to equator. Latitude is counted from the equator toward the pole; it will therefore be the complement of the angle just measured. It should be noted that latitude may be thus determined at any time of year and without knowledge of the sun's angular distance from the sky equator (declination).

*The pivot does not lie in the plane of the sun-circle, and the slanting line does not measure the sun's noon altitude, except at the equinoxes. The noon altitude of the sun varies through the year, but the slanting line (the slant of the plane of the sun-circle) is constant through the year, whatever the declination of the sun. In all this method of determining latitude it is assumed that the motion of the sun in declination in a single day will not be detected by the rough methods of record here employed.

An interesting feature of this elementary method of latitude determination is its novelty to many teachers. It involves nothing that grammar-school pupils who have learned by seeing and thinking, not by recitation, cannot easily apprehend if they are gradually led up to it by a well graded flight of steps; the steps are not difficult and the flight is not long. The fear that they are so, on account of which many a teacher dreads to introduce fundamental work of this kind into her teaching, only goes to show the obscurity and confusion in which the chapter on so-called "mathematical geography" is often enveloped. Leave out this forbidding name, teach slowly on the basis of gradually accumulated observations, and the imagined difficulties will disappear.

The determination of latitude by the altitude of the Pole star should always be preceded by a proof that the star is close to the pole; but even then the sun-circle method is to be preferred as being possible in the daytime. The measurement of latitude involving the sun's declination should not be introduced until the movement of the sun in declination has been followed and its greatest northing and southing measured by a simple method given below.

Size of the Earth.—Nothing has yet been said of the size of the earth. Observations at a single station will not serve to measure the size, but the essence of the method of measurement may be usefully imitated, and, by correspondence between two schools, actual measurement may be made, much to the edification of the pupils. The relations of the local horizon to the plane of the sun-circle, as involved in the measurement of latitude, enables the scholar to "see," if not to demonstrate, that an angle of one degree must separate the local horizons of two stations on the same meridian, whose latitude differs by one degree. Similarly, if observations of the sun's midday (meridian) altitude were made at two such stations on the same day the altitudes would differ by one degree. Then, measuring the distance along the meridian arc between the stations, a simple proportion gives the circumference of the meridian circle:

$$1^\circ : 360^\circ :: \text{length of arc} : \text{circumference}.$$

This imitates the method employed by Eratosthenes. Two parties of scholars stationed at the ends of a short meridian arc in a school yard or in an adjacent common may each determine the noon altitude of the sun and measure the distance between their stations in imitation of the genuine method of earth measurement, and they

may be convinced that if their observations were minutely accurate the size of the earth could be estimated from even so short an arc as that which they can pace during a recess interval. If a hill rises near the school the convexity of the hill may be taken to imitate the rotundity of a little earth. Two parties stationed out of sight of each other on the north and south slopes of the hill, and on a north and south line, may determine the sun's noon altitude with reference to the slopes of the hill (which imitate the curved, level surface of a little earth), and then measuring the arc between their stations, the size of a small earth to which such a hill would fit may be determined. In the absence of a hill, a useful substitute may be provided in a school yard by placing two tables or boxes in a north and south line fifty or a hundred feet apart, tilting their upper surfaces away from each other, and then proceeding on the pretense that the table surfaces are parts of a little earth, whose convex meridian may be indicated by the tops of a row of stakes between them. The curved surface of a globe in a school-room may be used to explain the geometry here involved, but outdoor work should not be altogether replaced by such indoor substitutes. Nothing can so well give the sense of the real great earth as outdoor observations.

Two schools can profitably coöperate to measure the size of the earth. On a certain day agreed upon beforehand the midday altitude of the sun is determined at each school. The length of the meridian arc between the latitude circles of the two schools may then be measured on a good map and the proportion of Eratosthenes again employed to find the unknown quantity. If each school determines its own latitude, the difference of latitudes replaces the difference of the sun's midday altitude on a given day, and then no agreement as to the day of observation is necessary. Why is it that nature study of this kind, so appropriate to the inhabitants of a rotating globe, is not introduced in our lower schools? Is it because of the supposed difficulty or the actual simplicity of the necessary observations; on account of a recognition or a neglect of their value; on account of a confidence in the innate ability of young scholars or a mistrust of their powers; or on account of preparation or lack of preparation on the part of the teachers? To the best of my belief, this is merely one of the many cases in which the real mental activity of school children is benumbed by substituting recitations of words for live performance.

Longitude.—Difference of longitude (introduced under any name that is suggested by the pupils when talking freely of the relative positions of places on a rotating globe—the technical name to come in later) can be determined between two schools in any one of the three historical methods. As Strabo employed an eclipse of the moon to determine the relative easting or westing of certain points bordering the Mediterranean, so school children in different parts of the country may employ a lunar eclipse today to determine the relative positions of the meridians on which their homes are situated, previously determining their local solar time, and subsequently comparing the recorded time of any phase of the eclipse by correspondence. As governmental parties a hundred years ago made chronometer expeditions between neighboring national capitals, so school children may today send a watch from one school to another by express, and thus make a very good determination of difference of longitude. As modern observers employ the telegraph for time comparisons, even if separated by the whole breadth of a continent or of an ocean, so school children may today delegate some of their number to go to a telegraph office and send "time signals" from their watch (previously set to local solar time by their own observations) to an expectant party at the other end of the line. The two parties may have to wait half an hour or so to get the line "clear," but such a trifling delay should be no obstacle to success; and even such delay may be avoided if a long-distance telephone is used; then the time signals may be counted aloud by one party and directly heard by the other. Surely it is not the lack of capacity on the part of the pupils; it is not the expense involved; it is not the difficulty or the uselessness of the work that keeps such practical experiments as these out of our schools. What is the real difficulty in the way of their introduction?

Indoor Exercises.—Practical exercises of another kind on the earth as a globe may be performed indoors.* A meridian section of the earth as a sphere and as a spheroid may be drawn to scale in order to show how vanishingly insignificant the polar flattening really is. Geographically, its value is negligible in a high-school course, however important and interesting it is in astronomy and however valuable it is historically as a proof of the earth's rotation. The height of the highest mountains, the depth of the deepest oceans, the mean altitude of continents, the mean depth of sea floors, and the rate of in-

*Several of these exercises have been suggested to me by Mr W. H. Snyder, of Worcester Academy.

crease of interior temperatures may all be shown on this earth section. Comparisons of local and general distances and heights may be made by drawing them to scale.

Several methods of map projection may be illustrated. First the necessity for projection should be shown by the impossibility of smoothly laying a paper, cut to match a continental outline, upon the surface of a globe. The mercator (or stove pipe and cannon ball), the conical, and the gnomonic projections may be easily constructed; their difficulties may be magnified if clothed in mathematical language or minified if talked about familiarly. After a network of meridians and latitude circles is drawn out a continental outline may be platted from a table giving the latitudes and longitudes of a number of points on the coast line. Greenland and South America on Mercator projection, Greenland on Mercator and conical projection, the margin of the unexplored areas in the Arctic and Antarctic regions on gnomonic projections all afford good practice for platting. Comparison of distances on globes and on maps serves to detect the distortion characteristic of each kind of projection. A great-circle sailing course between San Francisco and Yokohama, as determined on a globe, may be transferred to any projection by the latitude and longitude of a number of points on its path. The same may be tried on a polar gnomonic projection of the great southern ocean for a voyage from Cape Horn to Tasmania. The results in the two cases are interesting and instructive. From my own experience with school teachers in problems of this kind, it is necessary to conclude that geometry must, as a rule, have been very badly taught to them.

Terrestrial magnetism affords some interesting exercises, if time can be allowed to them. The local variation of the magnetic needle has already been determined. Charts published by the Coast Survey and elsewhere give, by means of lines of equal variation, the values of local variation at any desired point. Local values thus obtained may be copied off on the blackboard, and the pupils may then write in the values on a Mercator map of the world (of their own construction, if desired), or on an outline map of the United States. The values thus charted afford practice in drawing lines of equal variation. The accuracy of the work can be tested by comparing the results with the original chart. A variation on this exercise may be made by drawing arrows at various stations to represent the local direction of magnetic north. Extend the arrows, curving them, if necessary, so that they shall not cross each other; they will then represent magnetic me-

ridians. The north magnetic pole, in the neighborhood of Hudson Bay, may be thus discovered. The meaning of magnetic charts can hardly be made clear without performing exercises of this kind.

The point that deserves special emphasis with regard to all the exercises thus far described is not so much their importance, although all are important, but rather their practicability. If the shape and size of the earth, latitude and longitude, and terrestrial magnetism are taught at all, practical exercises should replace recited definitions as far as possible. In all stages of the work excellent practice in English composition is afforded by calling for written description of observations and for careful formulation of results.

The Atmosphere.—The study of the atmosphere suggests a great variety of practical exercises, many of which are now familiarly introduced in our schools. Local observations, without and with instruments, are made and discussed systematically. They are correlated with the larger phenomena of the weather maps, but the work in this direction often falls far short of its possible measure. In this connection I may refer to a recent book by my colleague, R. De C. Ward, entitled "Practical Exercises in Elementary Meteorology," in which the teacher and the pupil will find precise directions for the solution of a large number of problems that I am sure will be of great value in giving fuller appreciation of the treasures stored up in, but not always taken from, the daily weather maps. This guide book being now accessible, I need here refer only to certain problems that are associated with the seasons. Here, as under the earth as a globe, it is too commonly the practice to learn definitions, instead of developing a real knowledge of the subject by the study of gradually accumulated observations. The need of plenty of time, only to be secured by carrying on observations during one or two years, is nowhere better illustrated than in this chapter of the subject. It is impossible to compress the necessary observations into the short time during which a high-school course would be concerned with the atmosphere. Adequate attention to the subject can be obtained only when the work is distributed over a long period in the grammar school, associated either with geography or with nature study.

The Seasons.—The procession of phenomena observable in the annual succession of the seasons is observable in early school years. The observations here described are intended to connect the simplest seasonal phenomena with their causes, which are to be found in the revolution of the earth around the sun, and in the resultant northing

and southing of the sun (or its movement in declination, declination in the sky being the equivalent of geocentric* latitude on the earth).

The fact of seasonal change having been already recorded in a most elementary way, let a second record be made in connection with a search for the causes of change, as follows: At intervals of a fortnight or a month determine the midday altitude of the sun. At similar intervals determine the time, and if possible the compass direction, of sunrise and sunset.† Again, at similar intervals, have the scholars, or at least the brighter ones, note the star groups that appear in the east shortly after the time and opposite to the point of sunset. All the facts thus determined vary systematically and in correlation with one another. The discovery of their system of change and of the correlations in the system should, if possible, be reserved for the scholars. Their intelligence is only half developed if the discoveries that they can make are made for them. In such case it may be claimed that time is saved, and that the results reached are the same; but it should be seen, on the other hand, that the scholars lose much appreciation of the result if they do not find it for themselves, and that they will fail entirely to acquire the power and the habit of discovering if they have no practice in it. If American schools are developed on a truly democratic basis, as befits republican institutions, one of their chief values will be that they aid in giving every boy and

*This word, "geocentric," is inserted here in order to escape the criticism of the carping and captious. In oral explanation with teachers or scholars I should omit it and accept the consequences. In printed statement it is necessary to be more circumspect. If any member of a class should rise by his own exertions to an understanding of the difference between geographic and geocentric latitude, he would deserve and appreciate the fuller explanations that could be given in response to his questions; but to introduce into a first statement so fine a point as is implied in the use of geocentric would unnecessarily and unwisely delay and complicate progress.

† It is manifest that this requires observations outside of the school session and sometimes at rather inconvenient hours. But I would protest against the implication contained in objections to outside work, that lessons are so distasteful that none of the scholars will willingly give a little of their free time to such details as are here suggested. Early summer sunrise can be timed from sunset when it has been discovered during the winter that sunrise and sunset occur symmetrically before and after midday, or the moment when the sun reaches its highest altitude (meridian culmination). The general adoption of standard time introduces some confusion here, for it is desirable that sunrise and sunset should be recorded in local solar time. A watch kept to such time by observations of the sun at midday is useful in this connection. This is easily done when a north mark has once been established. The watch will then give the necessary correction for the steeple clocks and factory whistles, by which some scholars may have to make their morning and evening records.

A pocket compass for measuring the direction of sunrise and sunset may be lent to those scholars whose homes give the best view of the horizon. Compass readings should be corrected for local variation of the needle to give true bearings. The direction of early sunrise may be determined from that of late sunset when it has been discovered that the two are symmetrical with respect to the true meridian.

girl in the land a chance to emerge from the mass, where individuality is lost, and to reach a position in which they can do the most good for themselves, their homes, and their country. The cultivation of intelligence is as essential to this end as the acquisition of knowledge. The observations and correlations now in discussion may be made to contribute usefully to both these attainments.

The sun's midday altitude should be tabulated, and the change in its value should be indicated graphically. Records thus kept are in themselves educative, not only in forming habits of accuracy and neatness, but still further in familiarizing the pupils with the several methods of record, each best for its own purpose. Graphic record may be made on a diagram in which horizontal measures represent time (dates), and vertical measures represent angular altitude. As the line connecting successive points of observation is seen to be not straight but curved, let expectation be aroused as to the probable result of further observations, thus developing the habit of thinking forward from a basis of observations in the past and present. Test the expectations by comparison with later observations, and thus develop the more important habit of not jumping at conclusions. The frequency of sun observations should be increased as the solstices are approached, in order to give good determination of those important dates. Few pupils will fail to await with interest the first observations after the Christmas holidays, or to continue observations with unflagging interest even into the hot weather of late June. It is conceivable that some children might even carry on observations of this kind through the summer vacation, in order to complete their curve for the year. A graphic bisection of the upper and lower culminations of the curve, by lines drawn through the middle points of horizontal chords, will give good determinations of the dates of the solstices. When the upper and lower limits of the curve are well determined, draw horizontal lines tangent to them, and draw a third horizontal line midway between these tangents. Lead up to the discovery that this middle line represents the sky equator; that the date of the equinoxes is given at the two intersections of the equator and the sun's path, and that the angular distance (declination) of the sun north or south of the equator can easily be roughly determined for any day of the year by measuring up or down from the equator line to the curved sun path. Then, and not properly till then, are young geographers ready to use the noon altitude and declination of the sun in determining their latitude. When this

stage is reached, better values of the sun's declination may be taken from the Nautical Almanac for the current year, accessible in the larger public libraries. If it is not accessible there, ask the librarian to get it. The teacher of mathematics should be able to explain how to use it in finding the sun's declination on any date.

The Year.—The time and direction of sunrise and sunset should be tabulated and diagramed. The correlation of the day's length, the direction of the sun at rising and setting, and the changes in midday altitude are most instructive. Each quantity affords occasion for prediction and verification of its future values. All the changes in these quantities are run in a period of 365 days, and in the same period the star group first seen in the east shortly after sunset is again seen there at the same hour. Now let the scholars try to explain this return to a previous condition, suggesting to them that a line may be imagined starting at the sun, passing through the earth, and extending to the distant stars. This line has been found to sweep through the sky, pointing to one star group after another, and to return to the original group in the same period as that in which the noon altitude and its correlated quantities run through their variations. Then the earth must go around the sun once in 365 days. The time unit, called a year, has long been familiar to the scholars; they have probably heard or read that the earth goes around the sun in a year, but those words are now fuller of meaning than they were ever before.* The sensible constancy of the sun's diameter apparent (determined by letting a ray of sunlight pass through a pin-hole in one sheet of paper and fall upon another sheet at a fixed distance from the pin-hole) should serve to give a good idea of the form of the curve or orbit that the earth runs around.

Inclined Attitude of Axis to Orbit.—The facts regarding noon altitude and the correlated quantities can all be explained if it be suggested that the axis on which the earth has been found to turn does not stand vertical to the plane of the orbit in which it has been found to revolve. Here again a globe is of value as a mental aid and an aid in visualizing the necessary geometrical relations. So are the dia-

*In order to give a better determination of the length of the year than can be obtained merely by general inspection of the eastern constellations after sunset, the following plan may be adopted: Observations in September and October will show that the stars occupy more and more western positions at a given hour on successive evenings. Let the more skillful scholars make record of the position of some recognizable star with respect to a roof or chimney at a certain hour on a certain evening, then ask them to discover when the star will again be in that position at that hour. It will be well to have records of this sort made on several different evenings, so as to lessen the possible trouble from cloudy evenings in the following year.

grams that one usually finds in text-books, although they are much less serviceable than globes.* Whether children of under fourteen years of age can discover this solution of the problem or not remains to be proved. At least they should have a good chance to show their capacity to discover it, a carefully prepared chance, approached by the slow accumulation of pertinent observations, all familiarized by repetition.

A simple construction of the earth's orbit is also serviceable at this stage. Draw upon a sheet of paper about a foot square a line through its middle parallel to one side. Locate the middle point of the line. Construct a scale whose units are $\frac{1}{200}$ of the side of the paper, so that two pins, three units apart, can be driven into the middle line symmetrically on either side of the middle point. Lay a loop of thread or fine string 189 units in perimeter over the pins; stretch it tight with a pencil, and draw a curve thus guided. This curve shows the true pattern of the earth's orbit, the units of the scale being millions of miles. The orbit is as sensibly circular as are the earth's meridians. Take out one of the pins, and around the other draw a little circle, a trifle less than a unit in diameter, to represent the sun; a good-sized pin-head will not be much too small for it. Assuming that the North star is above the plane of the orbit (or paper), the earth moves around the orbit so as to pass from right to left when viewed from the sun. Find the point on the orbit that is nearest to the sun (it must lie where the orbit is cut by that half of the middle line which passes through the sun). Conveniently for our memories, the sun celebrates New-Year's day by passing through this near-sun point, or perihelion. July 1 sees the earth at the opposite far sun point, or aphelion. Go backward along the orbit from perihelion one-ninth of a quadrant arc; this is the point occupied on December 21, the date of the sun's least midday altitude, or the winter solstice. Draw a line from this point through the sun; it intersects the orbit at the summer solstice, which the earth passes on June 21. Draw a line through the sun at right angles to the solsticial line; it intersects the orbit in the equinoctial points. Set up a small ball on a vertical axis to represent the earth at the winter solstice; the sun can then be imagined to illuminate the near half of the earth; the day-and-night circle will separate the illuminated half from the dark half of the earth. As the earth now stands, with a vertical axis, the

* A simple, small and cheap "elementary globe," divested of nearly all names, and showing only the most general relief, is published by A. Donnelly, Oxford, N. Y.

plane of the equator passes through the sun; but this has been shown by observation to be impossible at the time of the winter solstice. On that date the sun is 23° south of the equator. The axis of the earth must therefore be tilted 23° from the vertical and away from the sun in order to imitate actual conditions.

As the prolonged axis meets the sky in the same point at all seasons of the year, the attitude of the axis must always be parallel to its initial position. Carry the earth around its orbit, holding the axis properly on the way, and observe the relative attitude of the day-and-night circle at different times of year. All the peculiar variations of the sun's midday altitude, of the times and directions of sun rise and set, and of the length of day and night can be explained by this little working model; hence it may be fairly said to present the conditions of nature. It is well that the scholar should know that it is entirely on the basis of such agreements between hypothesis and fact that text-books make statements about the inclination of the earth's axis, the duration of its annual revolution, and so on. There is no other door by which one can really enter the domain of knowledge, where the motto is written: "Truth for authority, not authority for truth."

When beginning to prepare this article it was my intention to cover other branches of the subject as well as those here treated, but on advancing into the manuscript it has seemed better to expand general recommendations into somewhat specific explanations in order to aid in carrying them into practice. Thus the article has grown unduly long. Something about practical exercises on the oceans and the lands may be presented at another time.

PROFESSOR HENRY ALLEN HAZEN

By a sad accident on the evening of Monday, January 22, 1900, the U. S. Weather Bureau lost one of its most prominent officials and the National Geographic Society one of its active members. Professor Hazen, while riding on his bicycle, hastening to his night work at the Weather Bureau, collided with a pedestrian and was dashed to the ground. He received injuries from which he died twenty-four hours later.

Professor Hazen was born January 12, 1849, in Sirur, India, about 100 miles east of Bombay, and was the son of Rev. Allen Hazen and Martha Chapin, his wife, missionaries of the Congregational Church. He came to this country when ten years old, and was educated at St Johnsbury, Vermont, and at Dartmouth College, where he was graduated in 1871. For some years he was instructor in

drawing in the Sheffield Scientific School, New Haven, and later was assistant in meteorology and physics under Professor Elias Loomis. He received an appointment in the Weather Bureau in May, 1881, being assigned to special duty on such problems as the investigation of the psychrometer and the proper exposures of thermometers, the study of thunderstorms, and other important questions. At a later period Professor Hazen was assigned to duties of a broader aspect, including weather forecasting and occasional editorial work on the *Monthly Weather Review*. In addition to his official work in the Weather Bureau, Professor Hazen was a frequent contributor to meteorological and other scientific journals. He was one of the supporters of *Science* during the years 1882–1889 and of the *American Meteorological Journal*, 1884–1886. Among his larger publications are the "Reduction of Air Pressure to Sea Level" and the "Climate of Chicago."

GEOGRAPHIC MISCELLANEA

The Peary Arctic Club (Brooklyn, N. Y.) in recording its admiration for Mr Peary's activity and persistence has pledged its unfaltering support to the remaining work of the expedition.

Notwithstanding the greatly increased cost, both of materials and labor, the shipbuilding output of Great Britain in 1899 was the largest on record, having reached the enormous total of 1,713,000 tons. Preliminary returns place the year's output in Germany at 257,927 tons, in the United States at 178,636 tons, and in France (the only other country exceeding 50,000 tons) at 60,586 tons.

A recent number of *Science* announces that an expedition organized by Baron Toll for the exploration of the New Siberia Islands and Saunikoff Land, into which no man has yet penetrated, will set out in June next from some Norwegian port. The party will pass the winter at a point on the banks of the Lena, above the town of Yokutsk, and in the summer of 1901 will begin their explorations toward the north.

Mr E. H. Harriman, the patron of the expedition to Alaska which bears his name, will publish the results of the expedition in a series of several volumes prepared under the general editorial management of Dr C. Hart Merriam. The first volume is to be a narrative of the expedition by John Burroughs, with a chapter on glaciers by John Muir, and other chapters by well-known writers. The scientific results, comprising several separate volumes, are being prepared by the specialists who had charge of the different branches of work.

Some months since the French Government, according to the *Le Tour Du Monde*, instructed P. Froc, director of the meteorological observatory near Shanghai, to choose some site in the French Indo-China colony and there establish a meteorological observatory. The director has chosen for the purpose a slight elevation near Tonkin called Kalan, which is only 400 feet high. The hill is near the sea, and the neighboring hills which encircle it form a sort of

enclosure, which is peculiarly sensitive to all the phenomena of the surrounding country, and also to the slightest disturbance from the sea. The observatory will thus have a maritime as well as a meteorological value.

The project of maintaining the level of Lake Erie near its high-water stage during the navigation season by constructing a dam across Niagara River below Buffalo harbor is reported by the Deep Water Ways Commission as practicable and desirable. Thus the water lost by evaporation in summer could be partially replaced by accumulating the surplus water during the closed season and releasing it when most necessary in the open season. The best location for a dam is, according to the board, at the foot of the lake, just below Buffalo harbor. A canal with a lock is provided on the American side around the end of the dam and the rapids at the head of the river. The cost of the regulating works is estimated at $796,923, and of the lock and canal at $2,325,967. The changes would raise the low-water stage about three feet in Lake Erie, two feet in Lake St Clair, and one foot in Lake Huron.

The U. S. Commercial Agent at Vladivostock, Mr Richard T. Greener, reports that it is proposed to turn the military port of Vladivostock into a commercial port, making it the principal terminus of the Trans-Siberian Railroad. Port Arthur will then become the chief military port of eastern Siberia. Talienwan, which has been renamed "Dalny," will be the commercial port, and an "open" one, of the Pechili Gulf. Every effort will be made to make it an important trade center. The plans of streets, government buildings, etc., are already formulated and will be put in execution, while the construction of the various lines of railroad is also being pushed to completion. The plan of the Russian government to form an eastern Asiatic steamship company to open communication between Port Arthur, the Manchurian Railroad, Vladivostock, and other ports of the Far East is now arranged. The service between Vladivostock and Port Arthur will soon be begun.

The *Manual of Tides* now being prepared in the Coast and Geodetic Survey Office by Dr R. A. Harris will discuss, among other subjects, the tidal theory. So far as the study of the tidal oscillations in the great oceanic basins has progressed, it tends to show that the dominating tides of most localities owe their origin to one of two methods of generation. The first is that implied in the corrected equilibrium theory, and pertains to rather small and well enclosed bodies of water; the second, and far more important, method is that implied in stationary oscillations whose free periods approximately coincide with the periods of the tidal forces. As an example of these oscillating areas may be cited the region lying south of the Maine coast, from Nantucket to the southern end of Nova Scotia. Following a line, somewhat convex, toward the south, joining these two points, there appears to be a small tidal disturbance, probably not more than two feet, whereas along the entire New England coast, north of Nantucket, the tides are in the neighborhood of from eight to ten feet. Moreover, on this nodal line just mentioned, running from Nantucket to Nova Scotia, the currents are well pronounced, so that it appears that we have here an area which oscillates about the nodal line as an axis, thus producing high water at practically the same time along the New England coast.

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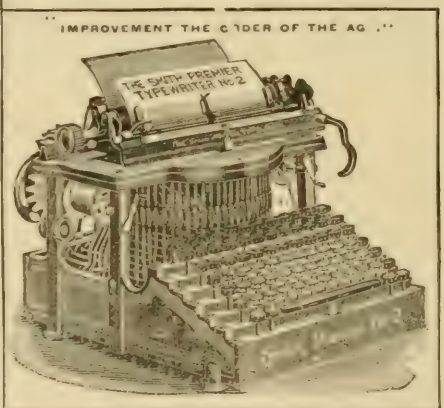

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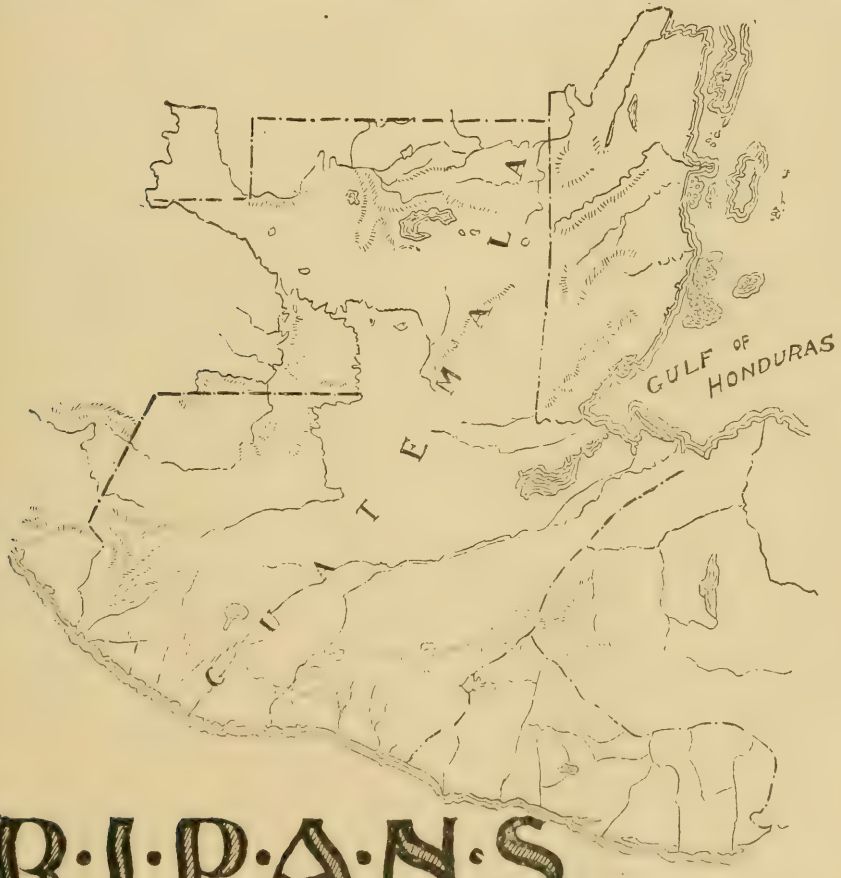

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WASHINGTON
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IN THE DRAKENBURG RANGE

THE

NATIONAL GEOGRAPHIC MAGAZINE

VOL. XI MARCH, 1900 No. 3

BRITISH SOUTH AFRICA AND THE TRANSVAAL

By F. F. HILDER,

Bureau of American Ethnology

To one approaching the coast of South Africa in the neighborhood of Table Bay from the west, the first object which strikes the eye is the great mass of Table Mountain looming up above the lower foothills of the coast. Passing Robben Island, the ship enters Table Bay, a magnificent harbor, protected by nature from all but northwest winds. A splendid system of breakwater and docks now affords safety to shipping at all seasons.

Round the base of the mountain lie the suburbs Rondebosch, Claremont, Wynberg, and Constantia, which are surrounded with luxuriant vegetation, including oaks, firs, shrubs of many kinds, flowers, and vineyards which produce excellent wine. Cape Town lies between the foot of Table Mountain and the bay; it is the capital of the colony, the residence of the governor, and the seat of the legislature. The population, numbering about 70,000, is composed of many races, those of Dutch and English descent being most numerous; but there are also Americans and representatives of nearly every country in Europe. The laboring population comprises the descendants of negro slaves, Hottentots, Kafirs, and Malays.

The Cape of Good Hope from the time of its discovery by Bartholomeu Dias, the Portuguese navigator, in 1486, until 1652 was a place of call for ships of all nations. In that year the Dutch East India Company sent Jan Van Riebeck with a small force and a party of colonists to form a settlement there and hold it as a Dutch colony. The home authority, however, was not the government of Holland, but the directors of the Dutch East India Company at Amsterdam. The Dutch found the country inhabited by a native tribe who called

themselves Khoikhoin (men of men), but had been named Hottentots by the Portuguese, and Caepmans by the early Dutch settlers. The Dutch had difficulty in subduing these natives or making them labor, so that in 1658 they determined to institute negro slavery, and imported the first cargo of slaves from the Guinea Coast.

In 1687 the Dutch colonists were joined by a number of Huguenots, refugees who fled from France during the reign of Louis XIV, after the revocation of the Edict of Nantes, large numbers of whom sought an asylum in Holland and her colonies. For more than a century these colonists pursued a quiet existence as agriculturists and traders, disturbed only by occasional strife with the natives, until 1794, when Holland was overrun by the troops of the French Republic. To prevent the colony from falling into the hands of the French, it was captured by the English in 1795, but was restored to Holland in 1802 by the treaty of Amiens. As this peace proved to be illusory, war was renewed the following year, and Cape Colony was again captured by the English in 1806 and has since been in their possession. In 1814, after the abdication of Napoleon, it was ceded to England by the treaty of Paris, which action was confirmed by the Congress of Vienna in 1815, and England paid to Holland a large sum of money as indemnity for the cession of Cape Colony and the territory in South America now known as British Guiana.

Leaving Table Bay and steaming eastward along the coast, mountains are in sight nearly all the way. To reach the interior of South Africa from any of the landing places on the east coast, a short extent of lowland must be crossed and steep mountains ascended to the level of the great plateau beyond. The east coast presents a fringe of subtropical country, where the magnolia and rose bloom and the orange, pineapple, lemon, grape, banana, cotton, and tea-plant flourish. As the elevation increases come the mountain ranges, in the valleys of which are growing crops of wheat and corn. Finally the high veldt is reached. This consists of vast level plains sparsely covered with short grass, dotted here and there by the karoo bush, a stunted shrub from a foot to eighteen inches in height, which gives pasturage to thousands of sheep and cattle.

There are four lines of railroad by which the South African Republic can be reached from the sea. The first extends from Cape Town and Port Elizabeth, with a branch from East London, to Johannesburg, and thence to Pretoria, traversing the Orange Free State from south to north. The second line lies more to the west and is wholly

in English territory. It starts from Cape Town, passes through Cape Colony, and follows closely the western frontier of the Orange Free State and the Transvaal. It passes through Kimberley and Mafeking, from whence a wagon road runs to Krugersdorp and Johannesburg. This road runs as far north as Bulawayo, about 1,300 miles north of Cape Town. The third road starts from Durban, in the colony of Natal, passes through Pietermaritzburg, the capital of the colony, and reaches Ladysmith, where it separates into two sections, one section extending westward into the Orange Free State and the other northward to Heidelberg and Johannesburg, in the Transvaal. This road enters the Transvaal territory through a tunnel under Laings Nek, a pass in the Drakensberg Mountains near Majuba Hill, where the English met such a crushing defeat in 1881.

The fourth line starts from Lourenço Marques on Delagoa Bay, traverses the Portuguese territory, enters the Transvaal at Komatipoort, and terminates at Pretoria. This is the only road by which the Transvaal government has been able to obtain supplies since the outbreak of the war.

The South African Republic was until a few years ago little known to the outside world. It was merely a pastoral and agricultural region, and such notoriety as it had achieved was due principally to the frequent wars and bloody contests between its Boer inhabitants and the British local and imperial authorities and the native tribes. Twenty years ago it was seldom visited except by traders and hunters in quest of big game, but the discovery of the marvelous gold deposits of the Witwatersrand in 1885 brought a rush of adventurers in search of wealth. It is true that gold had been discovered in the Lydenburg district as early as 1867, but not in sufficient quantities to attract great attention. Immediately a multitude of French, Portuguese, Germans, English, and Americans streamed into the country and the city of Johannesburg sprang up, like Aladdin's palace, in a day.

The Transvaal lies immediately north of her sister Boer republic, the Orange Free State, between the Limpopo or Crocodile River on the north and the Vaal River on the south. The country on the north and west is British. The republic has no seaport, as the Portuguese possessions and the colony of Natal shut it off from the Indian Ocean on the east. The Vaal River is the chief tributary of the great Orange River, which rises in the Drakensberg and flows across the continent into the Atlantic. The Limpopo empties into the Indian Ocean. The gold-bearing region, the Witwatersrand, or "White Water Range," forms the watershed between the two rivers.

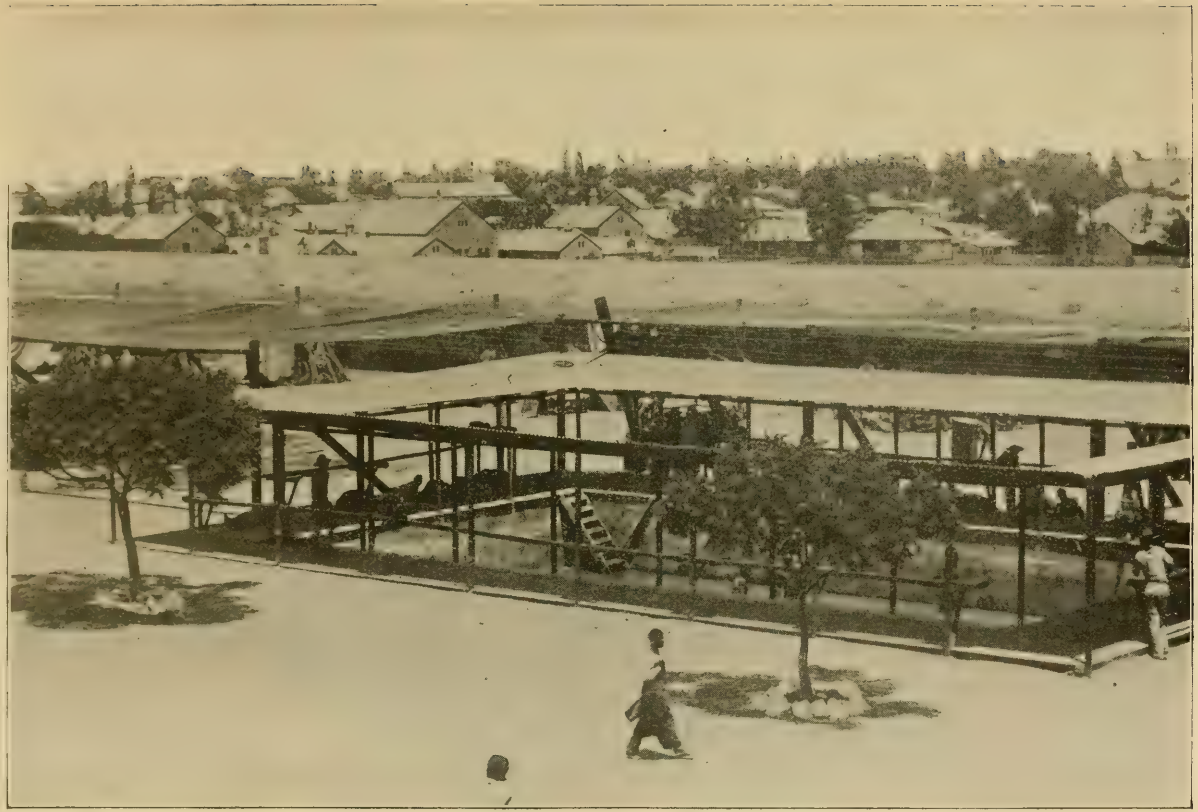
The Transvaal is a lofty plateau lying within the outer rim of the vast South African table-land, between 4,000 and 6,000 feet above the sea-level. In consequence of this great elevation, although it is intercepted by the tropic of Capricorn at a point between 60 and 70 miles to the south of its northern frontier, it enjoys a healthful and invigorating climate, except in some of the low-lying country on the Limpopo and other fluvial tracts near the eastern frontier. The winter half of the year, from March to September, is dry and cool, especially during the nights, but the days are often as warm as in summer. During these months cold, sharp winds blow from the south, and the mountain ranges are often covered for several days with snow, and hail storms are frequent.

In addition to its treasures of gold, the country is rich in other minerals, particularly iron. The Yzerberg, near Marabastad, is almost a solid mass of iron ore of the richest quality; coal of excellent quality is abundant, and supplies the mining industry with good and cheap fuel; copper, lead, quicksilver, etc., have also been found. The formations containing diamonds have also been found to extend into both the Orange Free State and the Transvaal.

Kimberley, the headquarters of the diamond industry, is in British territory, only four miles from the boundary of the Orange Free State and 647 miles from Cape Town. There are no natural features that can assist in its defense, but the great mounds of earth and debris from the mines have been utilized by the garrison for that purpose.

The dry diggings in the mines of the Kimberley district afford the only locality in which the diamond has thus far been found in its original home, and all our knowledge of the genesis of the diamond has been derived from the study of the conditions there existing. The mines are located in "pans" or depressions in which the blue ground is found that is now recognized as the matrix of the diamond. These pans formed the vents of ancient volcanoes which have been worn down by the forces of the atmosphere, and are the pipes or tubes through which the lava reached the surface; they are partly surrounded by black shale containing a large percentage of carbon, from which material the diamonds have been formed by crystallization.

As a proof of the wonderful progress which has been made in a place which only a few years back was a bare prairie, I will mention that a school of mines has lately been erected and opened at Kimberley. The courses of instruction are intended to prepare students for a diploma of mining engineer or for the degree of Bachelor of Science and Master of Science in mining engineering.



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The South African Republic has an area of 119,139 square miles, and in 1898 the population was estimated to be 1,094,156, of which 345,397 were whites and 748,759 colored natives. The white population, however, had been largely increased by the rush to the gold fields, and the number of Boers included in the enumeration of white inhabitants is probably less than 100,000.

In the whole of South Africa, in the same year, the white inhabitants, excluding the Dutch, numbered 385,500; of Dutch descent there were 431,000, making a total of 816,500 whites, while the native races numbered fully 15,000,000; so that there were about eighteen natives to every white inhabitant.

This sketch of the physical character and resources of the Transvaal is the stage setting of the theater, where a mighty human drama is now being enacted. A just estimate of the actors cannot be formed without considering the influences which have made the Boers what they are, nor can any conclusion be reached as to the future, not only of the Transvaal, but of the whole of South Africa, without considering the character and condition of the native population, a factor in the problem which has been seldom touched upon by writers of political and military essays on South African affairs.

The Boers are the descendants of the original Dutch and Huguenot colonists. Severed from the civilization of Europe two hundred years ago, they have not kept pace with the progress that has been made there and are intolerant and backward in their ideas, but they have developed into a sturdy, self-reliant people, well fitted to cope with the savage animals and savage men with whom they have had to contend in their colonization of the wilderness. They have been for the most part stock-raisers; the thinness of the pasture has caused them to scatter over a wide area, and they have thus led a solitary and somewhat nomadic life. Like all frontiersmen, they have developed remarkable courage and an indomitable spirit of independence; they have also become imbued with a passion for solitude and isolation, out of which has grown not only their impatience of control, but a certain degree of neglect of the graces, amenities, and even the decencies of civilized life, showing few traces of their descent from the cleanest and neatest people of Europe. Living in the open air, and mostly in the saddle, they are strangely ignorant. They have no literature and very few newspapers. Their reading is confined almost entirely to the Bible. Their religion is the somber and stern Calvinism of the seventeenth century, hostile to all new light, thoroughly imbued with

the spirit of the Hebrew records of the Old Testament, and with but little of the Christian spirit of kindness and mercy taught in the New.

In this characterization of the Boers I do not include the Burghers or more civilized Afrikanders of the cities, many of whom are as cultivated, well educated, and charming people as can be found in any part of the world.

The Boer skill with the rifle is due to long practice; with them hunting has been a matter both of dollars and cents and of self-protection. When they migrated from Cape Colony to the Transvaal they were compelled to clear the way by killing thousands of lions. Their creditable work of freeing the Transvaal from wild animals, that rendered life unsafe in the country, has been offset by their destruction of the giraffe, which has been almost exterminated by them from Cape Colony to their northern frontier. In the early days of South African history they were the most abundant wild animals in the Transvaal, Matabeleland, and the Orange Free State, but they have been exterminated like the American buffalo, and the few remaining representatives of the species have been gradually driven north. Like the buffalo, they were hunted because the skins had a commercial value, and even the bones and sinews were also turned to profitable account. In British territory they are now protected by law, but it is almost too late to save them from extinction.

For many years the Dutch and English lived together in amity, but in 1834 a law was passed in England abolishing negro slavery in all its colonies, much to the disgust of the Dutch, who held the old biblical notions on the subject of slavery. They fiercely resented what they believed to be an outrage on their property rights. It is true that the British government paid a compensation, but the amount being less than the current value of slaves in the colony, the Boer farmers considered that they had been robbed, and when the law was put in operation in 1835 they determined to leave the colony, and made what is still referred to among them as the "Great Trek."

They settled in what is now known as the colony of Natal, where they attempted to establish an independent government, a proceeding which was objected to by the British government on the ground that people who were still considered to be British subjects had no right to attempt to form an independent state in territory which, while it had not been formally declared to be a colony, was classed as a British protectorate. It was therefore formally proclaimed to be a British colony, and the Boers again migrated. Some settled in the Orange

PRETORIA — THE CLUB

CROSSING THE UMBELOSI RIVER, SWAZILAND

River country, and others crossing the Vaal River founded the South African Republic. The history of the troubles that have arisen between the Boers and the native tribes on the one hand, and the Boers and the British government on the other is too long and complicated for treatment in this paper, while the controversy which has unhappily terminated in the present war has been so thoroughly discussed in magazines and newspapers all over the world that I consider comment on that subject unnecessary. There have been faults on both sides, but so far as the British government is concerned the main cause of trouble has arisen from its vacillation and the want of a settled policy and course of action. With all the blessings of a government by popular representation, it has its weaknesses, and this is not the least of them. To this cause may be traced in great measure the uncertain and unstable policy which, so far as Great Britain is concerned, forms the head and front of her offending in South Africa.

Whichever way the present contest may terminate, it must lead to a better condition than that which has existed for many years past. If by any combination of circumstances the Boer Republics should be successful and the whole of South Africa were to be united under Dutch-Afrikander rule, even that would be better than the continual atmosphere of strife and unrest that has prevailed. It appears, however, hardly possible that the power of England when fully put forth can be successfully resisted by the Boers. Then the logical result would be the formation of a Dominion of South Africa, something on the plan of the Canadian confederation, in which men of all races could enjoy the benefits of a strong, united government, and all classes and nationalities would be equal before the law. With universal suffrage and self-government, confidence would be restored, capital would flow into the country, railroads and public improvements would be constructed, and the boundless resources of the country would be still further developed and utilized.

South Africa has the advantage of being a country where the white man can live and thrive as well as in Australia, New Zealand, or Canada. When the passions which have been aroused by the struggle have subsided, there is little doubt that not only the Dutch, but all other elements of the population will recognize the benefits of peace and progress and become peaceful citizens of a free state.

When peace shall be restored, the great question that will arise will be the relation of the white man to the native races; but before entering upon that phase of the subject I will briefly describe the people

with whom the white man has to deal. When the Dutch settlement was first formed at the Cape, southern and southwestern Africa was occupied by Hottentots and Bushmen. The latter were the aboriginal inhabitants of the country, but had been driven into the less fertile and desert regions of the southwest by the Hottentots, who were in turn being pressed from the north and east by the Bantu tribes.

The Bushmen are a race of pygmies, seldom much over four feet in height. They are brown in color, with tufted wool on the scalp, sparkling eyes, high cheek-bones, and small feet and hands. They are of the same race as those met with by Stanley on his Central African journey, and there is no doubt that they belong to the same race as the pygmies described by Herodotus, the Greek historian, as being "found beyond the Libyan deserts." The Bushmen can be classed with the Australian aborigines as the lowest race in the human scale, even the negritos of the Philippine Islands being of a slightly higher grade.

The Hottentots are of larger stature than the Bushmen, brown in color, with faces thinner than those of the Bantu tribes, high cheek-bones, and projecting lips, with tufted, wooly hair. Many of them in Cape Colony are the descendants of slaves, and the race there has been so long associated with the Dutch farmers that their language has practically died out, and most of them have adopted European dress.

The most important race of South Africa, however, is the Bantu, which is the generic name given to all the Kafir and Zulu tribes of South and Central Africa. These Bantu tribes are believed to be the result of an intermingling of a Libyan or Arab race with the typical negroes of western Africa. In them the nose is more prominent and the cast of the face higher than in the pure negro. The principal divisions of this people in the country treated of in this paper are the Kafirs, Zulus, Swazis, Basutos, and Matabeles; but as the Kafirs are the people most in evidence in Natal, the Boer Republics, and eastern South Africa, I will discuss them chiefly.

The name Kafir is of Persian origin, and is that applied by Mohammedans to all who reject the faith of Islam. It was in use along the coast of the Indian Ocean when the Portuguese explorers arrived on the east coast of Africa, and has passed from them to the English and Dutch, among whom the word Kafir is generally used to signify any colored native who is not the descendant of an imported negro slave. They are really the people of the Amacosa tribe of the great Bantu nation. Most of these tribes derive their names from that of their

TYPICAL BOER HOUSE AND TENT-WAGON

KAFIR MATRONS

first great chief and founder. The prefix "Ama" signifies "those of," *i. e.*, Amacosa, "those of Cosa." It is a curious fact that, although Europeans have given them the name of Kafirs, they themselves cannot pronounce the word, as the English sound of *r* is wanting in their language. In fact, they have no word to signify the whole race, and each tribe is known by its particular title. The women do not always use the same language as the men, owing to the custom which prohibits females from pronouncing the names of their husband's male relations or any words in the principal syllables of which such names occur. In this manner almost a distinct dialect has come into use among them.

As before the advent of white men the Kafirs knew nothing of letters or signs by which ideas can be expressed, their history is entirely traditional and at most does not reach back more than three or four generations.

Ornaments of shells, teeth, and beads strung on strips of skin are worn in the hair and on the body by both sexes, and copper and other rings on the arms and ankles. They protect their bodies from the effect of the sun by rubbing themselves with fat and red clay, which makes them look like polished bronze. This is necessary, as their clothing is infinitesimal in quantity; in warm weather men and children go entirely nude; in cold weather they use a square mantle of skins of animals, called "kaross," which they wrap round them as our Indians use their blankets. For the chiefs the skin of the leopard is reserved, but the skins of all other animals are used by the people. In consequence of the influx of Europeans and European manufactures, these skin mantles are largely replaced by blankets. Women wear a small leather apron at all times. Since the advent of white men clothing has been introduced among them, but they still show a propensity to get rid of as much of it as possible during warm weather.

Horned cattle constitute the wealth of the Kafir, and tending them and fighting he considers to be the only occupation fit for a man. The women do all the heavy work, not only the cooking, carrying water, etc., but the labor of raising such crops as they cultivate.

When the first railroad was built through their country they were filled with awe at the sight of a locomotive. As they had no conception of locomotive power other than that of oxen, they concluded that some of them must be shut up inside the machine; hence when the engine stopped they gathered in curious crowds waiting to see the

door open and the oxen come out. They also thought it an act of cruelty to make so small an engine draw such a huge train of cars.

The conditions I have described, however, are rapidly changing before the march of civilization. But beyond the present outlook there is a cloud on the horizon, very small now, but which may at no distant day increase until it overshadows South Africa and sweeps it with the destructive force of a tornado. There has existed for some time in South Africa an uneasy consciousness of danger, from the fact that many of the natives are restless and dissatisfied to a considerable extent. When it is considered that they so enormously outnumber the white inhabitants, this is no imaginary danger. The Kafirs, Zulus, Basutos, Swazis, Matabeles, and other tribes of the Bantu race are not now as a whole untutored savages or weaklings, but a brave, virile race. Many of them, particularly among the Kafirs and Basutos, are well on the road to civilization, professing the Christian religion, having school-houses and churches; many of them also are tolerably well educated, speaking both Dutch and English, and are no longer willing to quietly endure the lordly superiority claimed by the white man over dark-skinned races; they have begun to realize their grievances and to long for the rights of free men. The Boers have always been harsh and tyrannical in their treatment of the natives, a survival, perhaps, of the consequence of their long connection with negro slavery and the struggles they have had, first with the Hottentots, and later with the Kafirs and other Bantu tribes. The English have treated the natives with greater humanity and justice than the Dutch have done, and the government regulations for their management are excellent, but the danger is that private cupidity and the struggle for wealth may induce the white man to override or evade these regulations.

The supreme question in the development of Africa is not the increase of the power and prestige of England, Germany, France, or any other European nation. All the nations that have been reconstructing the map of Africa must recognize the great responsibility they have incurred toward the native races. After the present war-clouds shall have been dissipated the future of South Africa will rest largely on the question of equity and integrity in the treatment of the natives. If those principles are strictly observed, there will lie a bright prospect before the country and its people, both white and colored; but if the white man closes his eyes and does not recognize the handwriting on the wall, he may receive a very rude awakening.

THE HISTORY AND GEOGRAPHIC DISTRIBUTION OF BUBONIC PLAGUE

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Although bubonic plague has never prevailed within the limits of the United States, its recent appearance in our island possessions in the Pacific has aroused great interest in the disease and considerable apprehension as to its epidemic extension in the future. It has effected a lodgment in Portugal and in Brazil during the past year, and at least one vessel has arrived at the port of New York with cases of the disease on board from the last-mentioned country. The question is therefore a very practical one as to whether there is any real danger of the introduction and extension of this pestilential malady of eastern countries in our own territory.

In view of the interest attached to this question, I have been invited to prepare a paper for the National Geographic Magazine upon the history and geographic distribution of the bubonic plague, and after considerable hesitation I have consented to do so. My hesitation was due to the fact that I fear it will be difficult for me to present the subject in a popular manner, and the historical details relating to the ravages of this pestilential disease in the past may prove fatiguing to some and repulsive to others. However, while I shall have to present a dark picture with reference to the past history of the disease, and some disagreeable facts as to its recent extension from its endemic foci in the Far East, I shall have the satisfaction of stating that preventive medicine has made such progress during the past fifty years that there is very little danger that bubonic plague will ever again commit serious ravages in the more enlightened countries of Europe, or that it is a serious menace to the lives and prosperity of citizens of the United States.

The history of bubonic plague extends back to a remote antiquity. Greek physicians of the second and third centuries before the Christian era have left a record of a pestilential malady characterized by the formation of buboes, which prevailed in Libya, in Egypt, and in Syria, and two Alexandrian physicians, Dioscorides and Poseidonios, who were cotemporaries of Christ, have given a description of the disease

which leaves no doubt as to its identity with the plague of more recent times. It may be well to explain at this point that the buboes characteristic of the disease are enlarged and inflamed glands in the groins, in the armpits, and elsewhere, which in chronic cases may suppurate and discharge a virulent pus, by which the disease is propagated. We now know that the germ of the disease is found not only in these suppurating buboes, but also in the blood of an infected individual.

Three forms of the disease are recognized by modern authors. A mild or abortive form, in which there is little pain or fever, and in which the buboes rarely suppurate. In this form the enlarged glands in the groin, armpit, and neck usually disappear in about two weeks. In its usual form the disease is ushered in with chilly sensations, fever, lassitude, and pain in the back and limbs. The buboes are quickly developed and the general symptoms soon assume a grave character. If the patient lives for a week or more the buboes usually suppurate and carbuncles and boils are often developed. In the third or fulminant form of the disease death may occur within a few hours from the outset of the attack and in advance of the development of the characteristic buboes. These cases could scarcely be recognized were it not for the fact that they occur during the epidemic prevalence of the disease among persons who have been exposed to infection.

From the first to the sixth centuries of the Christian era we have no authentic accounts of the prevalence of bubonic plague, but there is no reason to believe that it had entirely disappeared from those countries in which it had previously prevailed. During the sixth century, however, its ravages were greatly extended, and it prevailed as a devastating epidemic in many parts of the Roman Empire, both of the East and of the West. Indeed, in the time of Justinian it extended far beyond the limits of the Roman Empire. The origin of this extensive epidemic, which raged for more than half a century, appears to have been in lower Egypt in the year 542; thence it extended in one direction along the north coast of Africa and in the other into Palestine and Syria. The following year it invaded Europe, which at the time was in a state of political disturbance and warfare, and during this and subsequent years devastated many sections of the country, depopulating towns and leaving the country in some instances nothing more than a desert inhabited by wild beasts. The accounts given of this widespread epidemic indicate that other infectious maladies, which at that time had not been clearly recognized as

specific diseases, were associated with the plague and contributed to the general mortality.

During the middle ages epidemics continued to occur, but the accounts of the nature of the prevailing "pest" are usually confused and unsatisfactory, and it was not until nearly the middle of the fourteenth century that the horrible epidemic known as the "black death" devastated Europe and caused the death of more than 25,000,000 of its inhabitants. There has been considerable difference of opinion among the best authorities as to whether the "black death" of the fourteenth century was identical with bubonic plague. It presented some features which seem to distinguish it from subsequent epidemics, and it had its origin from a different quarter of the globe. While bubonic plague has usually invaded Europe from Egypt, the "black death" is believed to have originated in Northern China. It is not known exactly when or where this epidemic had its origin, but it is known to have reached the Crimea in 1346 and Constantinople the following year. The same year it was conveyed by ships to several seaports of Italy, both on the Mediterranean and the Adriatic, and also to Marseilles, on the French coast. In 1348 it extended to the interior of these countries and to Spain; also to England, Holland, and the Scandinavian Peninsula. The following year it completed the invasion of Europe.

The disease first appeared in London in November, 1348, and it continued to prevail in various parts of England for a period of eight or nine years. In 1352 the epidemic prevailed in the city of Oxford to such an extent that this city lost two-thirds of its academical population. The plague again invaded England in 1361 and 1368. As a result of these devastating epidemics in England, as well as in other parts of Europe, large parts of the country remained for a time uncultivated, and owing to the lack of laborers there was a great increase in wages.

The following graphic account of the ravages of this pestilence is by a writer of the period:

"Wild places were sought for shelter; some went into ships and anchored themselves afar off on the waters, but the angel that was pouring the vial had a foot on the sea as well as on the dry land. No place was so wild that the plague did not visit, none so secret that the quick-sighted pestilence did not discover, none could fly that it did not overtake. For a time all commerce was in coffins and shrouds, but even that ended. Shrift there was none; churches and chapels were open, but neither priests nor penitents entered—all went to the charnel-house. The sexton and the physician were cast into the same deep

and wide grave: the testator and his heirs and executors were hurled from the same cart into the same hole together. Fire became extinguished, as if its element had expired, and the seams of the sailorless ships yawned to the sun. Though doors were open and coffers unwatched, there was no theft: all offenses ceased, and no cry but the universal woe of the pestilence was heard among men."

That the "black death" of the fourteenth century was in fact the same disease which subsequently prevailed in Europe under the name of "the plague," and more recently known as "bubonic plague," can scarcely be doubted. But the epidemic was characterized by an unusually large number of cases of the pulmonary form of the disease, in which it seems probable that the lungs are the primary seat of infection, while in the bubonic form the bacillus effects a lodgment through some superficial wound or abrasion or possibly through the bites of insects, and first invades the lymphatics, producing inflammation of the nearest lymphatic glands. General invasion of the blood appears, from recent investigations, to be a secondary phenomenon which only occurs in very severe and usually fatal cases.

The pulmonic form of the disease, which was so prominent in the epidemic known as "black death," is extremely fatal and is known to occur at the present day. Dr Calmette, a French physician, who was sent by his government to study the recent outbreak in the city of Oporto, Portugal, reports that the pulmonary form of the disease was observed at that place as well as the usual or bubonic form, and that in pulmonary plague there are no buboes, but the cases are marked at the outset by a profound depression of the vital powers, by violent vomiting, cadaveric paleness, a rapidly failing pulse, and death within a few hours.

In the fifteenth century plague was again rampant in various parts of Europe, and London suffered severely from the prevailing epidemic in 1400, 1406, 1428, 1472, and 1499. In southern Europe the disease prevailed extensively during the first quarter of the century, and in Germany it was especially severe in 1438–'39. Italy, France, and Spain were again ravaged by the pestilence in 1448 to 1450, apparently as a result of a fresh importation from Asia. In 1466 over 40,000 persons died from plague in the city of Paris. These frequent epidemics and the greater care with which they were studied resulted, about the end of the century, in differentiating bubonic plague from typhus fever, with which it was no doubt frequently associated and which was an important but unrecognized factor in the mortality

statistics of the epidemics which occurred during this and previous centuries. Typhoid fever is another disease which no doubt contributed largely to the general mortality, but which was not recognized as a distinct and specific infectious malady until the first quarter of the present century. We now know that this disease is endemic in all parts of Europe and America, and that under certain circumstances it may prevail as a fatal epidemic. While modern methods of diagnosis have enabled us to recognize typhoid fever, typhus fever, relapsing fever, and bubonic plague as distinct diseases, it must be remembered that up to the end of the fifteenth century no such differentiation had been made, and the term "pest" was applied to any fatal malady which prevailed as an epidemic, and no doubt included in some instances smallpox, which prior to the discovery of Jenner contributed largely to the general mortality of the population of Europe.

Bubonic plague continued to prevail in Europe in the sixteenth century, and we have authentic accounts of a devastating pestilence in China during this century, which was probably due to this disease. The disease prevailed in London in 1563–'64, and for a time the mortality exceeded 1,000 per week; later it prevailed in Edinburgh (1568–'74) and in other parts of the British Islands. On the continent the greatest mortality occurred at Moscow in 1570. Over 200,000 people are said to have succumbed to the epidemic in this city and its environs. The disease prevailed in different parts of France during the century, and in 1572 caused a mortality of 50,000 in the city of Lyons. A little later than this (1575) Europe again suffered from a widespread epidemic, which appears to have been started by the introduction of cases from Constantinople to seaports in Italy and by extension from the same city through Austria and Germany. The city of Venice is said to have lost 70,000 of its inhabitants during this epidemic, and in Germany the city of Breslau suffered a most destructive epidemic.

Bubonic plague still prevailed in various parts of Europe at the end of the sixteenth century, and early in the seventeenth century (1603) an epidemic occurred in London which caused the death of 38,000 of the inhabitants. It continued to prevail in this city and in various parts of England, and six years later caused a mortality of 11,785 in the city of London. At the same time it prevailed to some extent in Holland and in Germany. During the year 1603 a most disastrous epidemic occurred in Egypt which is said to have caused a mortality

of at least a million. After an interval of 10 or 15 years, during which there was a marked diminution in the number of cases and the extent of its distribution in European countries, it again obtained wide prevalence during the year 1620 and subsequently, especially in Germany, Holland, and England. The epidemic in the city of London in 1625 caused a mortality of more than 35,000. In 1630 a severe epidemic occurred in Milan, and in 1636 London again suffered a mortality of over 10,000, while the disease continued to claim numerous victims in other parts of England and on the continent. Later in the century (1656) some of the Italian cities suffered devastating epidemics. The mortality in the city of Naples was in the neighborhood of 300,000, in Genoa 60,000, in Rome 14,000. The smaller mortality in the last-named city has been ascribed to the sanitary measures instituted by Cardinal Gastaldi. Up to his time prayers, processionals, the firing of cannons, etc., had been the chief reliance for the arrest of pestilence, with what success is shown by the brief historical review thus far presented. But this enlightened prelate inaugurated a method of combating the plague and other infectious maladies which, with increasing knowledge and experience in the use of scientific preventive measures, has given us the mastery of these pestilential diseases, and has been the principal factor in the extinction of bubonic plague from the civilized countries of Europe.

But it was long after the time of Cardinal Gastaldi before sanitary science was established upon a scientific basis and had acquired the confidence of the educated classes. Indeed, the golden age of preventive medicine has but recently had its dawn, and sanitarians at the present day often encounter great difficulty in convincing legislators and the public generally of the importance of the measures which have been proved to be adequate, when properly carried out, for the prevention of this and other infectious maladies.

We have now arrived in our historical review at the period of the "great plague of London." For some years this city had been almost if not entirely free from the scourge, but in the spring of 1665 it again appeared and within a few months caused a mortality of 68,596 in a population estimated at 460,000. This, however, does not fairly represent the percentage of mortality among those exposed, for a large proportion of the population fled from the city to escape infection.

Upon the continent the disease prevailed extensively, especially in Austria, Hungary, and Germany. The epidemic in Vienna in 1679 caused a mortality of 76,000. In 1681 the city of Prague lost 83,000

of its inhabitants. But during the last quarter of this century the disease disappeared from some of the principal countries of Europe. According to Hirsch it disappeared from England in 1679, from France in 1668, from Holland about the same time, from Germany in 1683, and from Spain in 1681. In Italy it continued to prevail to some extent until the end of the century.

At the beginning of the eighteenth century the bubonic plague prevailed in Constantinople and at various points along the Danube; from here it extended in 1704 to Poland, and soon after to Silesia, Lithuania, Germany, and the Scandinavian countries. The mortality in Stockholm was about 40,000. The disease also extended westward from Constantinople through Austria and Bohemia.

In 1720 Marseilles suffered a severe epidemic, probably as a result of the introduction of cases on a ship from Leghorn. The mortality was estimated as being between 40,000 and 60,000. From Marseilles as a center it spread through the province of Provence, but did not invade other parts of France. In 1743 a severe outbreak, undoubtedly due to importation, occurred on the island of Sicily. A destructive but brief epidemic, which is estimated to have caused a mortality of 300,000, occurred during the years 1770 and 1771 in Moldavia, Wallachia, Transylvania, Hungary, and Poland. At the same time the disease prevailed in Russia, and in 1771 caused the death of about one-fourth of the population of the city of Moscow.

It would be tedious if I should attempt to give a full account of all the minor epidemics during this and preceding centuries, and I must now briefly review the history of the disease during the nineteenth century, which happily has witnessed its complete extinction in European countries. Early in the century (1802) bubonic plague appeared at Constantinople and in Armenia. It had previously prevailed in the Caucasus, from which province it extended into Russia. In 1808 to 1813 it extended from Constantinople to Odessa, to Smyrna, and to various localities in Transylvania. It also prevailed about the same time in Bosnia and Dalmatia. In 1812 to 1814 it prevailed in Egypt, and, as usual, was conveyed from there to European countries. Its last appearance in Italy was at the seaport Noja, on the eastern coast of that country, in 1815. A limited epidemic occurred in Greece in 1828 as a result of importation from Egypt. During the same year it prevailed extensively in Moldavia, Wallachia, and Bessarabia. In 1831 it again prevailed as an epidemic in Constantinople and in various parts of Roumelia, and again it appeared in Dal-

matia in 1840 and in Constantinople in 1841. Egypt, which for centuries had been the principal focus from which plague had been introduced into Europe, continued to suffer from the disease until 1845, when it disappeared from that country.

The last appearance of oriental plague in Europe, until its recent introduction into Portugal, was the outbreak on the banks of the Volga in 1878–'79. The disease had previously prevailed in a mild form in the vicinity of Astrakhan and was probably introduced from that locality. An interesting fact in connection with this epidemic is that in Astrakhan the disease was so mild that no deaths occurred, and that the earlier cases on the right bank of the Volga were of the same mild form, but that the disease there increased rapidly in severity and soon became so malignant that scarcely any of those attacked recovered. This is to some extent the history of epidemics elsewhere, and not only of plague, but of other infectious diseases, such as typhus fever, cholera, and yellow fever. In all of these diseases the outset of an epidemic may be characterized by cases so mild in character that they are not recognized, and during the progress of the epidemic many such cases may continue to occur. These cases are evidently especially dangerous as regards the propagation of the disease, for when they are not recognized no restrictions are placed upon the infected individuals, although they may be sowing the germs broadcast.

The termination of an epidemic in the presanitary period depended to a considerable extent upon the fact that those who suffered a mild attack acquired thereby an immunity, and that when the more susceptible individuals in a community had succumbed to the prevailing epidemic, there was a necessary termination of the epidemic for want of material. This is illustrated in such cities as Havana and Rio de Janeiro, where yellow fever is an endemic disease. The natives of these cities have an immunity which probably results from their having suffered a mild attack during childhood, and the epidemic prevalence of the disease depends on the presence of "unacclimated" strangers.

Another factor which no doubt has an important bearing upon the termination of epidemics is a change in the virulence of the germ as a result of various natural agencies. Time will not permit me to discuss this subject in its scientific and practical aspects, but the general fact may be stated that all known disease germs may vary greatly in their pathogenic virulence, and that in every infectious disease

mild cases may occur, not only because of the slight susceptibility of the individual, but also because of the "attenuated" virulence of the specific germ. In the eighteenth century, the beginning of sanitary science, isolation of the sick and seaboard quarantines came to the aid of these natural agencies, and did much in the way of arresting the progress of this pestilential disease. At the present day these measures, together with disinfection by heat or chemical agents, are relied upon by sanitarians with great confidence as being entirely adequate for the exclusion of this disease or for stamping it out if it should effect a lodgment in localities where an enlightened public sentiment permits the thorough execution of these preventive measures; but when the disease prevails among an ignorant population which strenuously objects to the carrying out of these measures, the contest between the sanitary officer and the deadly germ is an unequal one, and the stamping out of an epidemic becomes a task of great magnitude, if not entirely hopeless. This is illustrated by the experience of the English in their encounter with bubonic plague in their Indian Empire.

I shall not attempt to trace the history of plague in Asia, and, indeed, reliable data for such an attempt are wanting, but we know that bubonic plague has frequently prevailed in various parts of Asia Minor, in India, and in China. According to Hirsch, the first trustworthy information of the occurrence of plague in India dates from the year 1815, when it appeared in the low country of Hindostan, where it has prevailed to a greater or less extent up to the present day.

Tropical Africa has never suffered from the plague, and in general it may be stated that a tropical climate is less favorable to its epidemic extension than a semi-tropical or temperate one. This is shown by the records relating to mortality from the disease in Alexandria, Egypt. During the epidemic period extending from 1834 to 1843, the mortality invariably fell off during the months of June, July, and August, and a recrudescence of the disease occurred in December and January, the acme of mortality being reached in March.

All authorities agree that filth, famine, and overcrowding of dwellings are potent factors in the propagation of the plague, and it is for this reason that it is to a large extent a disease of the poor, and that epidemics are especially liable to occur during times of distress from insufficient harvests or the ravages of war. The idea that the plague may originate *de novo* as a result of the causes mentioned as favorable to its propagation is not supported by satisfactory historical

evidence or by what is known of other specific infectious diseases. Whatever may have been the original home of the disease or the circumstances to which it owes its birth, there is no reason to believe that during the period covered by our historical data it has occurred in any other way than by the introduction of infected individuals or animals or articles of clothing and merchandise from infected localities.

I must now refer briefly to the history of plague during the past decade. The disease seemed to be almost a thing of the past and no longer gave any uneasiness in the countries of Europe which had formerly suffered from its ravages, when, in February, 1894, it made its appearance in the city of Canton, China, and three months later in Hongkong. The disease is known to have been epidemic in the province of Yunnan, which is about 900 miles distant from Canton, since the year 1873, but it attracted little attention until the lives of Europeans living in the city of Hongkong were threatened by the outbreak of an epidemic among the Chinese residents of that place. Many thousands of deaths occurred in Canton during the three months which elapsed after its introduction into that city before it effected a lodgment in Hongkong.

Fortunately this outbreak gave the opportunity for competent bacteriologists to make scientific investigations relating to the specific cause of this scourge of the human race and to the demonstration that it is due to a minute bacillus. This discovery was first made by the Japanese bacteriologist, Kitasato, who had received his training in the laboratory of the famous Professor Robert Koch, of Berlin. This discovery was made in the month of June, 1894, in one of the hospitals established by the English officials in Hongkong. About the same time the discovery was made, independently, by the French bacteriologist, Yersin. From this time the study of plague has been established upon a scientific basis, and very material additions have been made to our knowledge with reference to the prevention and treatment of the disease. We have learned that certain of the lower animals, including rats and mice, are very susceptible to infection, and that they play an important part in the propagation of the disease; also that the germs are found not only in the blood and in pus from suppurating buboes, but also in the discharges from the bowels of infected individuals. This being the case it can readily be seen how important a strict sanitary police is in arresting the spread of an epidemic. As in other filth diseases in which the germ is present in the

excreta of the sick, insects, and especially fleas and house flies, probably play an important part in the spread of the disease.

Dr James A. Lowson, who has written an excellent account of the epidemic in Hongkong, says: "Filth and overcrowding must be recorded as two of the most important factors. The district of Torpingshan supplied these factors in a marked degree at the beginning of the outbreak, the majority of the houses being in a most filthy condition, as owing to the uncleanly habits of the people the amount of what is generally termed rubbish accumulates in a Chinese house in a crowded city to an extent beyond the imagination of civilized people. When to a mixture of dust, old rags, ashes, broken crockery, moist surface soil, etc., is added fecal matter and the decomposing urine of animals and human beings, a terribly insanitary condition of affairs prevails."

The period of incubation in bubonic plague, *i. e.*, the time which elapses between exposure to infection and the development of the disease, is comparatively short, usually from three to six days.

From the report of Dr Lowson of cases treated in the various hospitals of Hongkong under the control of English physicians, it appears that the mortality was much greater among natives of Hongkong than among the foreign residents of that city. The mortality among Europeans (11 cases only) was 18.2 per cent; among Japanese (10 cases), 60 per cent; among Portuguese (18 cases), 66 per cent; among Chinese (2,619 cases), 93.4 per cent. To a considerable extent, no doubt, this difference in mortality was due to the unfavorable surroundings of the natives and their lack of proper nursing and medical attendance, many of them being brought to the hospital in a dying condition.

Dr Lowson pays the following tribute to the trained female nurses who assisted in nursing in the plague hospitals:

"If ever this colony had reason to congratulate itself it was when we were able to procure well trained British nurses. I think the greatest compliment that I can pay these ladies is to say that had it not been for their presence there could have been no well run epidemic hospital during last summer. Amateur nurses at the beginning of an epidemic, or indeed at any stage where there is a rush, are worse than useless, and multiply the worries of a medical officer *ad infinitum*; not only this, but all outsiders took care to give our hospitals a wide berth. When in the hospitals it was often a matter of difficulty for the medical officers employed to keep their meals on their stomachs. It would have been much harder if they had had to remain in constant attendance all the time, as our sisters had to do. Smallpox is bad, but there is something specially

awe-inspiring in plague which seems to appall the onlooker. Cholera and smallpox show external evidences which make a spectator aware of the existence of a severe disease, but to witness rows of plague patients dying off in a hospital has, I am sure, a much more depressing effect on bystanders than the two diseases I have mentioned."

Three attendants in the various hospitals contracted the disease and died, but that attendants in a well conducted hospital run but little danger of infection is shown by the following statement by Dr Lowson: "It is to me a source of keen gratification that none of the attendants in the government hospitals were attacked." In this respect bubonic plague resembles cholera, typhoid fever, and yellow fever. In none of these diseases are the attendants upon the sick apt to contract the disease when proper precautions are taken as regards cleanliness of the patient and disinfection of excreta.

The plague bacillus is very easily destroyed by disinfectants. Dr Lowson reports that a one-per-cent solution of carbolic acid kills the bacilli within an hour, and a two-per-cent solution almost immediately. Quicklime was almost as prompt in its action. Exposure to fresh air for three or four days usually destroyed the vitality of the bacillus, and exposure to direct sunlight destroyed it in three or four hours.

Kitasato and Yersin both arrived at the conclusion that the disease may be contracted by inoculation through a wound or abrasion, by way of the respiratory tract when the bacillus is present in dust carried by the inspired air, or by way of the stomach when food or drink taken contains the bacillus. Experiments on rats and other animals show that they become infected when cultures of the plague bacillus are deposited upon the mucous membrane of the nose.

The Japanese physician, Aoyoma, who was associated with Kitasato, and who contracted the disease, but recovered, is of the opinion that in a great majority of the cases, and perhaps in all, infection occurs through an external wound. He calls attention to the fact that physicians and nurses in attendance upon cases of the disease rarely become infected, and states that during the epidemic of 1894 in Hongkong only three Japanese and one Chinese physician became infected, while all the nurses escaped: also to the fact that of 300 English soldiers who volunteered to clean and disinfect the Chinese pest-houses during the prevalence of the epidemic, only ten contracted the disease. The greater liability of the lower class of natives to contract the disease he ascribes not only to the insanitary surroundings in which

they live, but also to the fact that they seldom wear shoes and stockings, and thus are very liable to infection through insignificant wounds, scratches, or abrasions, both of the feet and hands. In this connection it is well to call attention to the fact that in former epidemics physicians have suffered severely, and that whatever immunity they enjoy is due to the observance of sanitary precautions, the importance of which has become apparent as we have acquired a more exact knowledge of the etiology of the disease. It is said that more than half the French physicians in Cairo perished from plague during the Egyptian epidemic in 1843, and in the Russian epidemic, having its principal focus in the town of Vettianka, in the year 1879, three physicians and many of the nurses who cared for the sick succumbed to the plague.

The appearance of plague in Bombay in 1896 is usually ascribed to importation from Hongkong. The first cases occurred in the month of August, but it was not until December that the death rate became alarming, the mortality for the last week in this month being 1,384. In January the mortality was nearly 5,000 and in February 4,600, although by this time the population of the city had been diminished by about one-half by the flight of its inhabitants. In March there was a notable reduction in the number of deaths, and this continued during April and May, and in August the disease had almost disappeared; but early in 1898 there was a recrudescence of the epidemic, and in November of that year the total mortality had reached 26,423. The disease extended throughout the Bombay Presidency, following, as a rule, the lines of railway. In this way it reached Surat and Baroda, on the northern line; Poona, Karad, and Miraj, on the southern; Calcutta and Nasik, on the eastern, and Sholapur and Hyderabad, on the southeastern. The total mortality in the Presidency of Bombay up to the latest reports (November 11, 1899) has been 164,083. At the same date bubonic plague was prevalent to a greater or less extent in China, Egypt, Japan, Formosa, Madagascar, the Straits Settlements, Persia, Portugal, the Argentine Republic, and Brazil. Quite recently cases have occurred at Honolulu, in the Hawaiian Islands, and at Manila, in the Philippines. The disease has also been introduced into New Caledonia, and from there to Sydney, Australia. What the future history of this disease may be in countries where, owing to a dense and ignorant population, modern sanitary measures are difficult to enforce, no one can say; but, as stated at the outset of this paper, sanitarians have little apprehension with

reference to its extension in America and the more enlightened countries of Europe.

I have already referred to the fact that rats are susceptible to infection by the plague bacillus. During the epidemic prevalence of the disease these animals die in large numbers, and there is good reason to believe that they play an important part in the propagation of the malady. It has been suggested that infection may be carried from rats to man through the agency of fleas, which swarm upon these rodents and desert them when they die. Plague bacilli have been found in the intestinal contents of the flea, and it is said that when an infected rat is freed from these parasites it cannot communicate the disease by association with healthy rats. There is nothing improbable in the view that the flea may act as an intermediate host for the plague bacillus and play an important rôle in the propagation of the disease under consideration. In this connection it may be well to recall the fact that the mosquito has been demonstrated to serve as an intermediate host for the malarial parasite, and to play an important part in the communication of malarial diseases to man; also that the tick is the intermediate host of the parasite which is the cause of an infectious disease of cattle known as Texas fever.

In a recent paper Professor Galli-Valerio, of the University of Lausanne, combats the idea that the flea which is parasitic upon the rat can be instrumental in conveying the infection of bubonic plague to man. In experiments made upon himself he was unable to obtain any evidence that this flea (*Typhlopsylla musculi*) will remain upon the body of a man unless under compulsion, or that it will puncture the skin of a man. He admits, however, the possibility that plague might be transmitted from man to man by the well-known domestic flea (*Pulex irritans*).

During the past two or three years a number of prominent bacteriologists have been engaged in researches relating to the prevention and cure of bubonic plague by means of an antitoxic serum obtained by the same method and in accordance with the same fundamental scientific principle as in the case of the antitoxic serum which is now so successfully employed in the treatment of diphtheria. The experiments thus far made have apparently been attended with a considerable degree of success. Professor Calmette reports that the serum of Yersin prepared at the Pasteur Institute, in Paris, proved to be curative in a considerable proportion of the cases treated during the recent outbreak at Oporto, and that protective inoculations conferred

a temporary immunity, which, however, did not last longer than twenty days. The mortality in cases not treated by Yersin's serum was 70 per cent; in those treated with it, 13 per cent.

The inoculations made by Haffkine in Bombay appear to have been quite successful. In his first experiment 8,142 persons were inoculated. Of these 18 subsequently contracted the disease and two died. Among 4,926 persons inoculated a single time at Dharwar, 45 were subsequently attacked and 15 died, while among 3,387 persons in whom a second inoculation was made only two were attacked. Haffkine uses in his inoculations a sterilized culture of the plague bacillus. The inoculation is followed by slight fever and enlargement of the nearest lymphatic glands. All symptoms disappear at the end of two or three days.

The figures just given are from the report of Mr E. L. Cappel to the Plague Commission. In this report Mr Cappel says:

"If this experiment had failed the results, judged by the actual mortality among the non-inoculated, would have been appalling. All sanitary measures in the shape of disinfection, unroofing of houses, and segregation were applied concurrently with inoculation, as the government is already aware; but the rate of mortality among those who held back from the inoculation rose at one time to a height which I believe has never been approached elsewhere, standing in the third week in September at the figure of 657 per thousand per week."

Another form of treatment used in Bombay hospitals is the "Heil-serum," also prepared under the patronage of the government, at the Parel government house, by the assistants of Professor Lustig, whose name it bears. The serum has not been extensively employed in India because of its scarcity, and also on account of the prejudices of the natives. It has, however, been used in some 500 cases, with 60 per cent recoveries and 40 per cent mortality, while the death rate in untreated natives may run as high as 80 per cent. Those who are engaged in making the serum maintain that much better results than those indicated in the above percentage can be obtained by increasing the number of healing units in the serum. In one of his articles Lustig states that he succeeded in curing completely 26 out of 30 cases of plague with his serum.

The appearance of a plague-stricken city at the present day is depicted in a graphic way by Doctor L. F. Barker, of Johns Hopkins University, who recently visited India as a member of the Medical Commission sent out under the auspices of the University. Doctor Barker says:

"Twice before Poona has been ravaged by the plague, and each succeeding epidemic, unfortunately, has been worse than the preceding. In February of the present year (1899) the chief plague authority stated that the disease had been stamped out of the city. In March and April the death rate considerably increased, and in July the disease appeared in its worst form, carrying off from 150 to 160 people a day. Normally, the city has a population of 140,000, but in five months it has dwindled to 60,000. But as the population went down, the mortality went up, and even at the time of our visit still persisted at the rate of 150 deaths a day. Such a rate of mortality in New York would mean about 10,000 deaths per day, 70,000 per week. Even in Poona enough people die in a month to populate a prosperous American city. During August there was an average of 100 hospital admissions per day and over 80 deaths.

"The excursion to Poona was most impressive. Traveling upward for hours through the Western Ghats, the country was so beautiful and the air so much cooler than at the sea-level that one could scarcely believe that he was approaching, in the plain a little lower down on the other side, the pest-stricken city of Poona. On arrival at the railway station, however, the first signs of distress were noticed. Train-loads of people were fleeing from the place. A drive through the town to the office of the chief plague authority showed how rapidly it was being deserted. Many of the streets were almost empty, shop doors and windows were closed and barricaded, plague notices were pasted on the wall, a preternatural stillness was everywhere noticeable, the few people encountered walking quietly along with heads bowed and faces sorrowful. A visit was made to some houses whence plague cases had just been reported, with the native editor of the principal Poona newspaper, this gentleman having volunteered his services as plague inspector. In a small hovel, scarcely larger than a ship's cabin, one might find a patient surrounded by several of his friends awaiting the arrival of the inspector. The chances for contact contamination were manifold.

"At the general plague hospital there were some eight hundred cases of the disease under the charge of Major Windle. He was assisted by eight European nurses and a number of native helpers. He complained that it was almost impossible to retain natives as workmen. Even washermen and grave-diggers could not be employed in sufficient numbers, owing to the fears and prejudices of the people. Cart-loads of the newly attacked were being brought into the hospital at its entrance, while a body was carried out from the wards every ten minutes to the morgue at the rear. Those who live in the West can scarcely appreciate the enormous disadvantages under which medical men fight plague in India. The people are ignorant and superstitious, the rigid caste rules prevent any successful application of modern hygienic measures, and even the preventive inoculation cannot be utilized to any great extent, owing to the fact that thus far the bacilli have been grown in beef broth, and the natives will not countenance such a profanation of the sacred animal. Even in death, caste rules have to be observed, and it was found at the morgue that partitions had to be put up separating the low-caste Hindoos from those of high caste, from the Mohammedans, and from the Parsees and Christians. The floor of the morgue presented a melancholy sight. In one of the rooms no less than thirty-two bodies

lay upon the ground as closely packed as was possible without actually piling the bodies upon one another. Mohammedans are buried and high-caste Hindoos are burned, but the bodies sometimes accumulate so fast that they cannot be disposed of by the usual methods. Major Windle stated that one day, a short time before, he had burned twenty-four bodies in one heap. It is absolutely impossible in Poona to employ occidental methods in the way of segregation or disinfection. The natives prefer to die rather than submit to rules which are obnoxious to them. It is no uncommon sight to see a widow, after uttering the death wail, beating her face and breasts and throwing herself violently upon the body of her dead husband, kissing his face and lips. It is very strange that no more than do contract the disease. One left Poona and Bombay thankful that in America no such unfavorable religious and social conditions prevail."

ICE-CLIFFS ON WHITE RIVER, YUKON TERRITORY

By Martin W. Gorman

During the season of 1899 it was my good fortune to make two trips across country from the Yukon to White River, the first a winter trip with dogs and toboggans, the second a summer trip in which we had to depend largely on back-packing, as we had only one horse for a party of four. On the first trip we left Fort Selkirk (lat. 62° 46′ 42″ N., long. 137° 20′ 22″ W.), 176 miles south of Dawson, March 24, traveling in a direction 20 degrees S. of W. and crossing White River about 200 miles above the mouth three weeks later.

In the course of this trip, while traversing the headwaters of the Klotassin River (the chief eastern tributary of the White), I observed some tracts which, while composed of a fairly rich soil, were overgrown with a small growth of alders, willows, and scrub birch (*Betula glandulosa*) and a decidedly sparse and dwarfed growth of black spruce (*Picea mariana*), ranging in diameter from three to eight inches and in height from 15 to 40 feet, and the only tree found growing thereon. Many of these trees were dying, or in a very unthrifty condition, while others, already dead, showed great masses of their small persistent cones still clinging to the tops, and thus gave the landscape a rather weird and uncanny appearance, as there was no apparent cause for their death.

In close proximity to these tracts the same tree, fully 80 feet high, and its near congener, the white spruce (*Picea canadensis*), more than 100 feet high, could be found growing on a much less fertile soil. In

trying to account for this anomaly, I, at the time, attributed it to the possibility of these tracts being the beds of ancient lakes; that the water of the spring freshets lay too long thereon, and that the cold from this source caused the dwarfing of the trees.

On the second trip we left Fort Selkirk July 22, reaching White River at a point a few miles south of our former crossing on August 6. In again traversing the same region I found that the vegetation on these tracts gave no evidence of any protracted submergence during the spring freshets; that the amount of water resulting from the melting snows in spring was much less than expected, and that the depauperate condition of the trees must be attributed to some other cause.

While camped on the river bank awaiting the return of my companions, I frequently heard large masses of earth and trees tumble into the river with a loud report from the face of a bluff on the east bank about one and a half miles below camp, and finally decided to go down and examine it, as the water was then low, and there was no apparent cause for any serious or continuous undermining of the river banks at that season.

This bluff was situated about 210 miles above the mouth, and proved to be a truncated hill with strong evidence that a slough from the river at one time divided it from the mainland, and that it then formed an island. On climbing to a spot on the face of the bluff, from which it could be more closely examined, I found that the supposed hill was simply a mass of ice about 60 feet high, surmounted by a capping of earth from five to seven feet deep, composed of a superimposed layer of sand and gravel either alluvial or morainal, and above this a deposit of decomposed vegetable matter about ten or twelve inches in depth, the whole overgrown by a stunted growth of trees such as I had previously seen on the supposed old lake beds.

About two weeks later, while drifting down the main stream on a raft, at a point on the east bank about 25 miles below the bluff above mentioned, I observed another of these ice-masses, this time situated in low ground and only 20 feet high, and surmounted by some six feet of earth, and, as before, covered with a stunted growth of trees. Three days later, on August 31, at a point on the west bank about 16 miles above the confluence of the main stream with the west branch (Katrina River of recent maps)—in other words, 113 miles above the mouth of the river—I observed the third of these ice-cliffs, this one being about 30 feet in depth from the present water-level to the top and sur-

mounted by about six feet of earth, with the usual superimposed layer of decomposed vegetable matter. On seeing the first two I at once recalled to mind an article by Lieut. J. C. Cantwell on "Ice-cliffs on the Kowak River."* The diminutive magnitude, almost pigmy in size, of these cliffs as compared with those seen on the Kowak by Lieut. Cantwell, may to a great extent be accounted for by the difference in latitude and amount of winter precipitation. Lieut. Cantwell does not state the depth of the winter's snow, but says "the banks of the stream in the region where the ice-cliffs are found are not all filled with ice," which is sufficiently suggestive. The greatest depth of snow in midwinter on the White River (except about the extreme headwaters near the Coast Range) is only about four and one-half feet, and it is dry and powdery, disappearing rapidly in spring without causing nearly as much of a freshet as I had anticipated. No loose ice whatever remains along the banks of the river through the summer, though it is to be found in the V-shaped gulches and valleys of the smaller affluents.

It was only on seeing the third cliff that the true nature of these ice-masses suggested itself to me, *viz.*, that they are the remnants of buried glaciers through which the stream has recently cut its way. There is ample evidence of recent and vigorous erosion, the water at present being so surcharged with a mixture of fine blue clay and granitic sand that a bucket of it on being allowed to settle will reveal a deposit of about one-fourth inch in depth, while small boulders and pebbles are being forced along over the bars and riffles by all the vigor of a seven to ten-mile current. On the other hand, the evidence of glacial action, at least of recent date, is lacking, so far as my observation went, though a more thorough examination, particularly among the harder rocks of the divides and crest lines, will, I think, reveal former activity. Such glacial action as did occur will probably prove to be due to local glaciers, as there is no evidence of either a large continental ice-sheet or of the amount of precipitation necessary for its formation.

The third cliff occupied the bottom of a small valley, and its appearance, together with the stunted growth of black spruce on its surface, so strongly resembled the tracts I had seen on the headwaters of the Klotassin in March, and then supposed were old lake beds, that I was at once forced to the conviction that the cause was the same in

* National Geographic Magazine, vol. VII, p. 345, Oct., 1896.

both cases, and that the latter as well as the former are underlain by masses of ice.

When the face of the cliffs, as in the first two instances, was toward the south, the powerful action of the sun's rays during the long subarctic summer days of the region had made its effects very apparent on the upper portion of the cliffs, both of which were to a great extent hidden by talus, slopes of earth, muck, uprooted trees, and brush, this latter a factor that made their detection from midstream much less likely. The face of the third cliff, being toward the north, was perpendicular, its base washed by the stream, and was without any talus whatever. All of them under present conditions are undoubtedly undergoing a process of rapid diminution.

I think it more than likely that both the Kuskokwim and Tanana rivers will, on examination, reveal ice-masses of a similar nature to those on the Kowak and White, though no mention of such being observed is made either by Hallock * or Allen.† When such are found, if any, they may enable the geologist to determine the real nature and cause of these bodies of ice, if the above theory of their being the remnants of buried glaciers is not accepted.

The main stream of White River and the Katrina or west branch both take their rise among the glaciers of a range of snow peaks lying east of and approximately parallel to the Coast Range, in Alaska, not far from the sources of the Tanana and Copper rivers, while the east branch (Klotassin River of the maps) is non-glacial and has its source in a number of small affluents in Yukon Territory. The water of the Klotassin is as clear as crystal, whereas the water of the main stream and the Katrina is almost milky white, thus giving rise to the name White River (first applied by Robert Campbell, of the Hudson's Bay Company, in 1850, and called Milk River by the early miners). Ladue Creek, on the other hand, which enters from the west some 36 miles above the mouth and takes its rise in the tundra and sphagnous marshes near the headwaters of Sixtymile River, is of a decided brown, being about the color of fairly strong tea. The main river is rather more than 300 miles long, following the course of the stream, and has no rapids worthy of the name, but there are a cañon and rapids five miles long on the west branch about 60 miles above the confluence. The country is dotted with lakes and lakelets in the vicinity

* National Geographic Magazine, vol. IX, p. 85: "Two hundred miles up the Kuskokwim," Charles Hallock, March, 1898.

† Reconnaissance in Alaska, Lieut. H. T. Allen. Washington, 1887.

of the confluence of the White and Katrina, scores of them being visible from the summit of a small table-topped mountain immediately west of the mouth of the latter stream. There is no reliable map of the White and its tributaries in existence, since nearly all of them show Ladue Creek as about equal, if not superior, to the Katrina in size, whereas it discharges less than one-tenth as much water as the latter, which almost equals the main stream in size. The Nisling River of the maps I was unable to find unless it is represented by a comparatively small creek which does occur in the vicinity indicated.

There is considerable evidence of recent volcanic activity in the valley of White River, and this evidence is much more pronounced in the region between the White and Yukon. It is in this section that we must look for the mountain or caldera responsible for the immense deposit of volcanic pumiceous ash which forms so noticeable a feature of the banks of the Yukon from Caribou crossing to Dawson, a distance of 520 miles by the course of the stream. There is not a trace of it to be seen along the banks of the White except near the mouth, while it is very noticeable along the banks of some of the creeks between the latter and the Yukon. This would preclude the possibility of this deposit being caused by an outburst from Mt Wrangell, as suggested by Dawson,* as an outburst from any mountain in the vicinity of Wrangell would undoubtedly deposit even a greater layer of the ash on the White than it would on the Yukon.

Another theory regarding this deposit,† *viz.*, that it is not of recent date and that deposition took place in water while the upper Yukon was yet a great inland lake and before the present river channel had been cut, is also untenable, as the ash in many places may be found overlying old drift-piles of perfectly sound wood, notably at the mouth of Stewart River and again above the mouth of the Pelly. It therefore still remains for some energetic member of the next Dominion Geological Survey party that traverses this region to locate the caldera from which such an extensive and remarkable deposit has been ejected. The solution of the question is certainly worthy of an effort.

* Report on an exploration of the Yukon district, N. W. T., 1887, George M. Dawson, p. 45. B. Dawson Bros., 1888.

† Alaska and the Klondike, Angelo Heilprin. D. Appleton & Co., 1899.

A HUNTING TRIP TO NORTHERN GREENLAND

By Fullerton Merrill

On July 21, 1899, the steam sealer *Diana* left Sydney, Cape Breton Island, bound for northwestern Greenland. She was commanded by Mr H. L. Bridgman, secretary of the Peary Arctic Club, and was to take supplies for Lieutenant Peary and his party, and to bring back news of what they had accomplished during the previous year. Besides the Peary relief expedition, there was on board a North Greenland hunting party, eight in number, led by Mr Russell W. Porter, of Boston, of which company I was a member.

The *Diana* steamed through the Gulf of St Lawrence and Belle Isle Strait, and on July 24 entered Domino Run, from whence her course was laid for Disko Island. That same night we encountered an ice-pack of small floes, and it was fifteen hours before we were again in open water. On July 30 we touched at Godhavn, next at Upernivik, and soon afterward we reached Melville Bay. We expected to have a tussle with the Melville Bay pack, but found, much to our surprise, that it was nowhere to be seen, having probably been blown to the westward, so that we crossed the bay in twenty-two hours, thus beating all previous records. At the Eskimo settlement at Cape York we met the first of the Whale Sound natives—the Arctic Highlanders. At Dalrymple Island we killed many eider ducks, and at Saunders Island obtained three Eskimo guides for the hunting party. On August 4 the *Diana* dropped anchor between Hakluyt and Northumberland Islands, in the mouth of Inglefield Gulf, this being the region chosen for walrus hunting. With tents and equipments we of the hunting party landed on Northumberland, in a little cove almost surrounded by mighty rock masses surmounted by a crowning ice-cap. The ship steamed away to the north.

As we had not learned the art of harpooning—a walrus if shot before being harpooned usually sinks at once—the beginning of the work was left to the natives. When a walrus was discovered in the open water, an Eskimo started off in a skin kayak, we following at a little distance in a large boat, ready to do our part with the rifle when the animal had been harpooned. After the harpooning we would make for the inflated seal-skin float, which was attached to the harpoon line, and make it fast, and then as soon as possible draw it into the

boat, and in another second would be tearing along through the water in the wake of an angry walrus. As the huge beast came to the surface the man whose turn it was to shoot would try to put an end to the animal's struggles by a well-placed bullet in the back of the neck.

It often happened that walrus would be seen on an ice-floe, sometimes from six to a dozen being on a single pan. In such cases one or even two of the natives would come into our boat and stand up in the bow while we headed directly for the walrus. Silently we would creep up until the floe was reached or even struck by us before the walrus would take to the water. Then the harpoon would flash, the sea would be alive with angry tusks, and it would look as though the destruction of the boat was inevitable; but after firing a few shots here and there at the more furious of the animals peace would again reign, with only the absurd-looking floats to tell of the tumult.

Early one morning, while we were still on the sea after a night of it, we came upon so many walrus that the natives hesitated to attack them. Everywhere could be seen herds of a dozen or more, now rising high above the water, now disappearing below its surface, and as we drew near their furious grunts and bellowings rent the air. The shore was miles away. At this point there was nothing but glacier front and steep gray cliffs, while but a single ice-pan floated between us and the land. Nearer and nearer drew the lines of battle, our white boat a conspicuous object against the green of the water, and still the walrus kept closing in about us. Suddenly a herd of six or eight rose out of the water but a few yards away and bore down upon us as we lay with our broadside turned toward them. Each man grasped his rifle, while one stood up and, imitating the grunts of the animals, called them on. Then, when but a few feet of water separated them from us, he raised his rifle and fired at the leading bull in the herd. The shot struck the animal fairly in the face, and quick as a flash the whole herd disappeared. They must have gone right under the boat, so great had been their impetus. As the early morning mists faded away the walrus became quieter, and in a short time only a few dozen of them were seen sporting among the ice-cakes in the mouth of Inglefield Gulf. Needless to say, there were several walrus heads in our boat when, after a long, hard row, we landed before the camp.

The next day the *Diana* appeared. Those on the ship had had walrus hunting as well as we, having received a message from Lieutenant Peary to the effect that he needed fresh food for his dogs.

Brave "Matt" Henson, Peary's colored companion, was also on board, having been picked up at Etah, and on the ship's deck were 10 or 15 Eskimo. For a few days we took part in the hunting, and during that time reached our farthest north, the entrance to Smith Sound, a little above 78° north and something more than one degree south of the ship's farthest north (79° 10′); then one glorious summer day we left the ship and pitched our tents on the rolling shores of Olriks Bay. We knew that there reindeer wandered over the moss-covered uplands, and we had come to hunt them.

We stayed four days at this place, hunting over the country for some 10 miles to the southeast. We got five deer, but we thought there might be better hunting farther up the fiord, so on August 15 we moved camp. Twelve hours later, after a hard fight against wind and tide, we landed beside the red-brown cliffs and black lava masses of Mt Gyrfalco.

For eight days we scoured the shore and the mountain plateau above for deer. The country was everywhere open, low ridges and occasional large stones being the only protection afforded us. The stalking was of the most arduous description; when game was seen the hunter must "drop" at once and crawl along over marshy places and sharp stones until near enough to risk a shot. The chances were that in spite of all precautions the deer would note his approach and be off like a flash. Many were the hunts and many the disappointments. We soon felt, moreover, that the deer were not nearly as numerous as we had supposed, considering the extensive area over which they wandered; nevertheless, by August 23 nine had been killed, making a total of 14. As the Greenland reindeer makes very good eating, we lived well. On one occasion one of our party while hunting alone discovered a herd of five deer and by skillful manœuvering succeeded in killing every one of them.

In the intervals between our hunts after larger game we killed birds and small animals. Specimens were obtained of almost every kind of bird known to frequent those parts of Greenland. Among these were the burgomaster gull, turnstone, black turnstone, parasitic jäger, various shore birds (including snipe), and the hawk-like gerfalcon. Eider ducks, both male and female, were seen flying in flocks, and once a flock of geese was discovered sitting on a mud flat. Little auks and guillemots were also plentiful. Arctic hares and rabbits, the latter the smaller of the two and with fur of a bluish tinge often graced our table and were considered by us excellent eating.

Almost everywhere along the Greenland coast we had caught glimpses of the Great Inland Glacier, or mighty Ice-Cap, which covers the interior of the country. From the North Water a vast stretch of the great ice-sheet had been seen, flowing over the peaks which bordered Inglefield Gulf.

On August 23 we started with dogs, sledges, and Eskimo dog drivers for a trip upon this mighty table-land of ice. Three Eskimo with their families had come over with us from Inglefield Gulf, and we had two sledges and eight dogs. In the afternoon we rode across Olriks Bay, each man shouldered his pack, the Eskimo took up the dog-traces, and we were fairly on our way.

Our route lay up a steep glacier, to the west of Half Dome Mountain. To the right Olriks Bay ended abruptly in the white mass of the Marie Glacier; opposite rose the high plateau we had scoured so often for deer, and beyond, in the dim distance, stood out the purple mountains on the north shore of Inglefield Gulf, bearing on their summits the eternal icy covering of Greenland. We descended into a valley. Soon the soft, spongy soil of the latter changed to a field of ice, and the dogs were harnessed again to the sledges. But the ice was exceedingly sharp and rough, and the poor dogs howled most piteously; before long, indeed, their wounded feet were leaving blood-spots on the snow. So we harnessed all but two—which ran away—to one sledge, and pulled the other ourselves, until, a rocky ridge appearing, we halted and camped for the night.

By the next afternoon we had skirted a river, made another passage over rough ice, and were standing, at a point some six miles inland, before the towering white wall of the Great Inland Glacier. The steep slope was many hundred feet in height, and it was something of a struggle to climb it, but it was done, and, the snow furnishing easy traveling, the dogs were once more divided between the two sledges. With sledges, snow-shoes, and *ski* we made good speed. Gradually the land behind us faded away, and the undulating surface of the ice-cap became more level; on every side stretched the snowy wastes of the Arctic continent.

Three or four reddish-brown nunataks cropped up through the snow far to the left. A low ridge of ice was ascended, and at the same time a line of pale blue mountains, probably those about Wolstenholme Sound, came into view to the southwest. A sort of snow-fog settled upon us, covering us with hoar-frost.

Here, some fifteen miles from the ice edge and at an elevation of

more than 5,000 feet above sea-level, we scooped a hollow in the snow, pitched a shelter tent over it, using sledges and snow-shoes as supports, and banked the whole with snow. Snow was melted and food cooked over a "Primus" oil stove, and soon afterward, with the midnight sun brightly shining, we lay down to rest—we just filled the little shelter—and the natives kept warm by stretching themselves out between our sleeping-bags.

The next afternoon, as we started on our return, the vast expanse of the ice-cap sparkled brilliantly. In due time the ice-edge was reached. Jumping on the sledges, all hands enjoyed a royal coast to the land-level. The part of the inland ice traversed by us had never before, I believe, been traveled over by human beings. The Eskimo told us that no natives ever went there. Early on the morning of August 26, a tired party, we broke our way in the large boat through a thin coating of ice in Olriks Bay, and later on walked into our camp on the shore. We were told by our steward that Lieutenant Peary, who had been cruising about on the *Diana*, had visited the camp during our absence.

We were picked up by the *Diana* August 28, near the lower narrows of Olriks Bay. In Baffin Bay it was discovered that our coal was giving out. Fortunately, we were soon able to obtain enough from an outcropping seam on the shore of Disko Island to carry us to Battle Harbor, Labrador. There more coal was purchased, and on September 12 we landed at Sydney, Cape Breton, after a voyage which had been most successful, and which demonstrated the possibility of a summer hunting trip to the Arctic regions.

A CANAL FROM THE ATLANTIC TO THE MEDITERRANEAN

For the past twenty years the construction of a canal across the Iberian Peninsula to connect the Atlantic Ocean with the Mediterranean Sea has been strongly advocated in France. A bill urging its construction and signed by 130 members was introduced last year into the Chamber of Deputies, and is at present being considered by the Naval Committee of the Chamber, with a prospect, says *Le Tour de Monde*, of a favorable report. The strategic importance to France of such a canal in case of war with England is apparent. England's presence at Gibraltar could no longer prevent France from uniting her Mediterranean and Atlantic squadrons.

The canal as proposed starts from Bassin d'Arcachon, on the Atlantic Ocean; thence, with a branch to Bordeaux, passes through Marmande, Agen, Castelsarrasin, Toulouse, Carcassonne, Narbonne, and finally terminates in the Étang de Sijean, on the Mediterranean Sea. The entire length of the canal will be about 280 miles. The plans that have been prepared provide for a width of 37 meters, increased at intervals to 61 meters to allow vessels to pass each other, and for a depth of eight and one-half meters, and nine meters in the locks. The highest point of the canal, about 655 feet above sea-level, it is estimated would be on the hill of Naurouse, which is the lowest point in the watershed of the Garonne and of the river flowing into the Mediterranean. To reach this elevation 22, or perhaps only 18, locks will be necessary.

According to careful estimates prepared by some of the most experienced engineers of France, the total cost would be about $160,000,000. The annual receipts, on the other hand, based at 75 cents per ton, will easily reach $13,000,000 a year. The expense of maintenance, repairs, etc., is estimated at $2,000,000 annually, and the interest at four per cent on the investment at $6,400,000, making a total annual expense of about $8,500,000 a year. There would thus be a net profit of about $4,500,000 a year. It is stated that the canal could be completed within five years, allowing one year for the preparation of the necessary plans, charts, etc., and four years for their actual construction.

By the construction of this canal the water route from Isle d'Ouessant, on the northwest coast of France, to the island of Malta, in the Mediterranean Sea, would be shortened by 1,090 miles. Vessels moving at the rate of six and one-half miles an hour could, including time lost in the locks, easily accomplish the passage in 58 hours.

DISEASES OF THE PHILIPPINES

The expedition sent out by the Johns Hopkins University to investigate the prevalent diseases in the Philippines has submitted its report to the University Medical School. Notices of the plans of the expedition have previously appeared in the NATIONAL GEOGRAPHIC MAGAZINE. (See vol. X, pp. 280, 421.) Two months, May and June, were spent in the study of disease among the natives and American troops in Manila and at Cavite. Owing to the military situation, it was found impracticable to visit other ports in the Archipelago or to penetrate into the interior of the island of Luzon.

Of the diseases affecting the natives, smallpox is the most prevalent. This

disease, the commission states, has been so common in Luzon that the natives have to a large extent lost fear of it. All evidence points to the greatest carelessness in preventing its spread during Spanish times. Isolation of the sick and disinfection of the habitations seem not to have been attempted, and vaccination, even among the Spanish garrison, had not been carried out. Under these circumstances it could be no surprise that after the American occupation the disease should appear and even become epidemic; but the prompt action of Dr Bournes, chief health officer of Manila, who caused the Spanish garrison still in Manila and the natives and Chinese within the city to be vaccinated on the appearance of the disease early last year (1899), has afforded most satisfactory results. Other diseases especially affecting the natives are: leprosy, of which there were a hundred cases in the San Lazaro Hospital, all coming from Manila and the country surrounding that city; tuberculosis, of the extent of which accurate statistics are impossible to obtain, but the facts would indicate that it is a very common disease; beriberi, well known among the natives and apparently epidemic and endemic in its nature. Skin diseases, as might be expected, are also prevalent.

Of the diseases affecting Americans, dysentery is responsible for the greatest amount of invalidation and the highest mortality. Typhoid fever, while less prevalent than dysentery, is, however, a frequent affection among Americans. Malarial fevers would seem not to be very common. Other diseases which while not prevalent affect foreigners to a considerable extent are tuberculosis, dengue, and tropical ulcers.

While outfitting at Hongkong, and later on their return to Hongkong *en route* to America, the commission improved the opportunity to study the bubonic plague, which was still prevailing at that port. Two members of the party, Dr Barker and Mr Flint, also passed three weeks in India, where the great epidemic of plague was then raging. This is a brief summary of the results achieved by the expedition. Naturally the commissioners have not yet been able to complete the scientific portion of the work. They are now making careful studies of the material relating to beriberi, dysentery, malarial and typhoid fevers, leprosy, and the bubonic plague, and later will publish their results in complete form.

GEOGRAPHIC MISCELLANEA

The United States steamer *Nero* in its survey for a Transpacific cable recorded one sounding near Guam Island of 5,269 fathoms—the deepest sea-sounding ever recorded.

Reports from Valparaiso, Chile, describe a fossil of the whale species discovered on the north beach at Caldera. It is stated that the fossil measures about 32 feet and is almost perfectly preserved.

With the completion of the triangulation between Chatham and Sumner Straits the work of triangulation in southeastern Alaska is ended, and the necessary geodetic data for the preparation of maps have been obtained.

The present membership of the National Geographic Society is 1,300 resident and 1,300 non-resident members. This is an increase of 1,000 since June 1, 1899, when the systematic effort to enlarge the work of the Society was begun.

The Constantinople correspondent of the London *Times* states that, as compensation for the Bagdad railway concession to Germany, Russia has demanded of the Ottoman Empire prior railway concessions in Asia Minor north of the German line.

Announcement is made of the resignation of Mr John B. Hatcher from the chair of assistant professor of geology in Princeton University, to accept the curatorship of vertebrate paleontology at the Carnegie Museum in Pittsburg, Pennsylvania.

From the fourth report of the International Commission on Glaciers it would appear that out of 70 glaciers measured in the Swiss Alps, 12 are advancing, while 55 are receding. In the eastern Alps the retreat of the glaciers is noticeable, though not with the same rapidity as in the period from 1870 to 1890.

The longitude of Maricopa, Arizona, has recently been determined by a U. S. Coast and Geodetic Survey party. The initial station was El Paso, Texas. Signals were exchanged on three successive nights, after which the observers changed places and three more nights' observations were obtained, thus eliminating the effect of personal equation.

Capt. George Owen Squier, of the Signal Office, War Department, contributes to a recent number of *The Independent* a summary of the arguments in favor of a United States Pacific cable. A map accompanying the article shows the routes of the proposed United States Pacific cable, the route of the proposed English Pacific cable, and also the proposed international cable spans.

In a recent number of the *Pathfinder* is a description of a set of five relief-maps of the continent, prepared for the Paris Exposition by E. E. Howell, the well-known relief-map expert. They are all on the same horizontal scale, one inch to 120 miles, and average five feet square. The vertical scale is 1 to 500,000, the deepest ocean depths being depressed about three-quarters of an inch.

It is expected that the committee of judges appointed by the National Geographic Society to award the prizes of $150.00 and $75.00 offered by the Society for the best and second best essays submitted during 1899 relating to pre-Columbian discoveries and settlements of the Norsemen on the mainland of North America will reach a decision in the near future, and the announcement of the successful contestants will then be made.

William Henry Gilder, an Arctic explorer of the seventies and early eighties, died in February at Morristown, New Jersey. In 1878 he joined the Franklin search expedition, commanded by the late Lieutenant Frederick Schwatka, U. S. A. While serving with this expedition from 1878 to 1880 he made a sledge journey of over 3,250 miles in King William Land, probably the longest sledge journey ever made in the Arctic regions. He has written the narrative of the expedition in "Schwatka's Search."

In *McClure's Magazine* for February is an interesting article by Mr Walter Wellman, entitled "The Race for the North Pole," a narration of his Arctic ex-

plorations during 1898–'99. A detailed account of the geographic results of the expedition was given by Mr Wellman in the National Geographic Magazine for December. The same number of *McClure's* contains an article by Cleveland Moffett, "The Inside of the Earth," giving Professor Milne's observations and conclusions as to the interior of our planet.

"The Bubonic Plague" is the title of a report recently submitted to the Secretary of the Treasury by Walter Wyman, Surgeon-General Marine Hospital Service, and issued by the department in pamphlet form. This valuable brochure is a revision of a paper prepared by Dr Wyman and published in the annual report for 1897. The many facts that have become known within the past few years with regard to the epidemic have been incorporated into the revision, with the result that the bulletin embodies in available form the latest information which may be of value to quarantine officers, health officers, and all interested in the study of the disease.

Reports from the three field parties of the U. S. Coast and Geodetic Survey at work on the south coast of Puerto Rico state that satisfactory progress is being made, and that triangulation, topography, and signal-building are going on simultaneously. Signals are located to within a few miles of Guanica, and the topography is finished to Guayanilla Bay. A large lagoon, to which little attention has heretofore been given, though a prominent feature on the coast, has been surveyed near Point Cuchara. The entire country west of Ponce and as far as Cabo Rojo is covered with a thick growth of brush and trees, which requires lines to be cut at every station, thus considerably retarding the work.

The following is the present condition of railway construction in the Chinese Empire: Lines constructed, 365 miles; lines in process of construction, 2,615 miles; lines for which concessions have been granted, 4,125 miles. Of this total of 7,105 miles constructed, in process of construction, and conceded, 495 miles are under German control, 810 miles under American, 1,380 miles under English, 805 miles under Belgian, 670 miles under Chinese, 490 miles under French, 690 miles under Anglo-German, 1,765 miles under Russo-Chinese. To this total of 7,105 miles must be added 1,970 miles of railroad proposed and 2,885 miles of railroad for which surveys have been made but no concessions granted.

The following report is interesting as the latest rumor concerning Andrée: "A letter received in London from Bishop Newnham, dated October 1, Fort Churchill, Hudson Bay, says: 'Two Eskimo came here this summer, traveling from the far north, to tell that two white men had come down from the sky in a balloon, the remains of which they had seen, and had been murdered by some Eskimo there. I believe this is authentic, but have not had time to inquire. Sad, if this be the last of poor Andrée and his companion.'" The fact that a letter from Bishop Newnham dated September 8, 1899, has been received in Toronto, wherein no mention is made of the supposed murder of Andrée, discredits this latest report from London.

A very instructive article on the geography of Abyssinia and the manners and customs of its inhabitants is the main feature of the *Geographical Journal* for February. The author, Herbert Weld Blundell, in March, 1898, accom-

panied the first English diplomatic representative to the capital of Abyssinia, Adis Abeba. Later, in November of the same year, he organized a party of several naturalists and passed the next six months in journeying up and down Abyssinia, finally reaching Khartum June 1, 1899. The party collected, in addition to eighteen different kinds of antelopes, 10 elephants and two lions, 520 specimens of birds, representing 299 species, of which 11 are new. The whole collection has been presented to the British Museum.

As a result of the South African war, the supply and, in consequence, the price of coal in Italy have been seriously affected. This is due partly to the increase of price in England and partly to the fact that the means of transport are becoming insufficient, inasmuch as the English government has hired a large number of transports belonging to companies and to private individuals. From an article which appeared in *L' Italie*, Rome, and a translation of which Ambassador Draper has transmitted to the State Department, it appears that in January the price of coal reached $9.65 per ton in Genoa and $11.58 in Milan. Owing to the scarcity, it was feared that many industrial establishments would be obliged to shut down and thousands of workmen thrown out of work.

Preliminary work is well under way on the railway from Tsing-chau *via* Wei hsien to Isi nan fu, the provincial metropolis of Shantung, with a branch line to Po-shan, the concession for which was granted to a German company by the Chancellor of the Chinese Empire in June, 1899. The first delivery of tires, sleepers, rails, and small iron tools was shipped during December, 1899, and the foundation work for a double track is already provided for. The company has pledged itself to complete the road within five years and the extension within three years. By the construction of these 280 miles of railway, the great coal districts in the north of the province of Shantung will be brought into practical communication with the important districts between Tsing-chau and Isi nan fu and with Kiao-chau.

The series of articles descriptive of the different forest reserves of the United States that were embodied for the Division of Forest Reserves in the Nineteenth Annual Report of the U. S. Geological Survey have recently been published as separate brochures. The series, which were prepared under the general direction of Henry Gannett, Chief of the Division of Geography and Forestry, include: *The Forests of the United States*, by Henry Gannett; *The Black Hills Forest Reserve*, by Henry S. Graves; *The Eastern Part of the Washington Forest Reserve*, by Martin W. Gorman; *The Washington Forest Reserve*, by H. B. Ayres; *The Teton and Yellowstone Park Forest Reserves*, by T. S. Brandegee; *The Priest River Forest Reserve* and *The Bitter Root Forest Reserve*, by John B. Leiberg; and *The Big Horn Forest Reserve*, by F. E. Town. Each paper is handsomely illustrated and accompanied by maps showing wooded areas, distribution of timber species, burned and restocked areas, and other practical facts. The series may be obtained by applying directly to the U. S. Geological Survey, Washington, D. C.

Material for the revision of the coast charts of New Jersey has reached the U. S. Coast and Geodetic Survey Office. In order to keep these maps up to date at a comparatively small expense, a party was put into the field during the latter half of 1899. Sufficient data were collected in this short time to prac-

tically revise the entire edition of coast charts, making them now about equal in value to those which would have resulted from a new survey. South of Bay Head the material changes are not great; but north of this point, where the details are too intricate for the methods pursued, a plane-table survey is recommended for areas beyond the local maps. Many changes were noticed in the inlets, and they take place so rapidly that a good channel one year may become a mud flat, bare at low tide, the next. These conditions are particularly noticeable at Absecon and Egg Harbor inlets. Where regular lines of steamers traverse the waters just inside the entrance, the steamboat companies find it necessary to locate the channel after nearly every heavy storm. The bars at the mouths of the inlets are all very shoal, few having more than three or four feet of water at low tide.

At the Sixth International Geographical Congress in 1895 the Geographical Society of Finland exhibited a number of charts and maps planned to represent the country and general condition of the people, many of the charts having been especially prepared for the occasion. Encouraged by the favorable reception accorded the maps, the society decided to add to the series and to publish the whole as an atlas of Finland. This atlas, which has recently been completed, contains a series of 32 large maps, from which an excellent comprehension of the present physical, economic, and social conditions of Finland may be obtained. The following charts are especially valuable: A series of six meteorological charts showing the amount of rainfall and snowfall a year, the average temperature, the direction of winds, etc.; a series of five charts showing the proportion of rural and city population, the population by professions, whether of native or foreign origin, etc., and charts giving statistics of farm products, of metals, of exports and imports, of telegraphs and telephones, railways, etc. Perhaps the most striking chart is that which shows that more than 70 per cent of the population is not represented in the Diet, the National Assembly.

A recent number of *Petermann's Mitteilungen* contains an interesting article, which by means of a two-colored map shows very clearly the proportions of the agricultural and industrial population of the German Empire. Green, which represents the agricultural sections, is the prevailing color in all parts of the empire except in Saxony and along the basin of the Rhine, where red, representing the industrial sections, predominates; in other words, the eastern part of the empire is agricultural, while a considerable part of the western section is industrial and commercial in its interests. As a consequence of the insufficient means of communication between the two sections, the articles manufactured in the east find abroad a more accessible market than in the western section; but the agricultural interests of the west, being handicapped by lack of outlet to the rest of the empire on the east and prohibited by excessive foreign duties from sending their produce to Russia and Austria, are in danger of being destroyed; hence the scheme for a canal through the center of Germany, which is at present before the Reichstag and which has been personally advocated by the Emperor. The map shows that, while German commerce has developed within the last few years to such an extent as to arouse the anxiety of England, it is yet far from equaling the agricultural interests of the empire.

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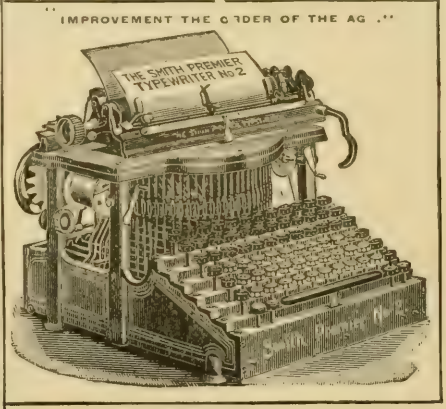

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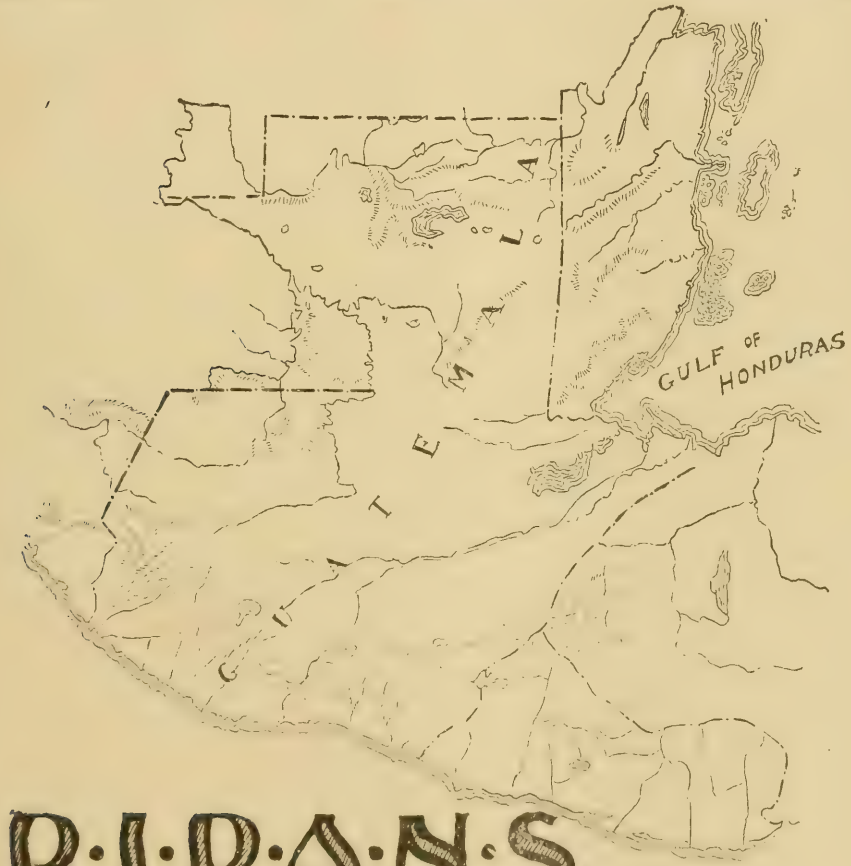

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NATIONAL GEOGRAPHIC MAGAZINE, Corcoran Bldg., Washington, D. C.

JUDD & DETWEILER, PRINTERS, WASHINGTON, D. C.

Vol. XI APRIL, 1900 No. 4

THE

NATIONAL GEOGRAPHIC MAGAZINE

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WASHINGTON
PUBLISHED BY THE NATIONAL GEOGRAPHIC SOCIETY
FOR SALE AT BRENTANO'S:
31 UNION SQUARE, NEW YORK; 1015 PENNSYLVANIA AVENUE, WASHINGTON;
218 WABASH AVENUE, CHICAGO; 37 AVENUE DE L'OPERA, PARIS

Price 25 Cents $2.50 a Year

THE

National Geographic Magazine

AN ILLUSTRATED MONTHLY

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The list of contributors to the NATIONAL GEOGRAPHIC MAGAZINE includes nearly every United States citizen whose name has become identified with Arctic exploration, the Bering Sea controversy, the Alaska and Venezuela boundary disputes, or the new commercial and political questions arising from the acquisition of the Philippines.

The following articles will appear in the Magazine within the next few months:

"Russia," by Professor Edwin A. Grosvenor of Amherst College, Massachusetts.

"The Colonial Expansion of France," by Professor Jean C. Bracq of Vassar College, Poughkeepsie, New York.

"The Samoan Islands," by Mr Edwin Morgan, Secretary of the Samoan Commission.

"The Native Tribes of Patagonia," by Mr J. B. Hatcher of the Carnegie Museum, Pittsburg, Pennsylvania.

"The Characteristics of the Filipinos," by Hon. Dean C. Worcester of the Philippine Commission.

"Discoveries in the Fossil Fields of Wyoming in 1899," by Prof. Wilbur C. Knight of the University of Wyoming.

"Explorations on the Yangtse-Kiang, China," by Mr Wm. Barclay Parsons, C. E., surveyor of the railway route through the Yangtse-Kiang Valley.

Entered at the Post-office in Washington, D. C., as Second-class Mail Matter.

MAP SHOWING BOUNDARIES AS CLAIMED BY GREAT BRITAIN AND VENEZUELA AND AS AWARDED BY THE PARIS TRIBUNAL, 1899

THE

NATIONAL GEOGRAPHIC MAGAZINE

VOL. XI APRIL, 1900 No. 4

THE ANGLO-VENEZUELAN BOUNDARY DISPUTE

By MARCUS BAKER,

Cartographer, U. S. Geological Survey

Introduction.—For nearly three score years Great Britain and Venezuela had wrangled over their boundary. No dividing line had ever been drawn by them, acting together. Venezuela always claimed to the Essequibo River. Great Britain, successor to the Dutch, claimed all the Dutch had had. The Dutch never established their limits on the Venezuelan side, and their indefinite western limit did not shrink in the hands of the British. In the course of a long diplomatic correspondence, proposals and counter-proposals were made and rejected. Thus for fifty-five years the squabble dragged on and on, from the days of Schomburgk, in 1841, to the day of Cleveland, in 1895. Cleveland's now famous message has been called harsh, but, as has been well pointed out and as the sequel shows, it made for peace. Sometimes a frank, blunt word, like the surgeon's lancet, hurts cruelly, but cures.

Already the story of this dispute is ancient history. It requires some imagination to recall the tension which, only four years ago, strained, almost to the breaking point, the friendly relations of the two greatest world powers. War between Spain and America; war between Great Britain and the South African Dutch; Venezuela torn and rent by civil war; and in the midst of it all a peace conference of the nations at the Hague striving, working, hoping for perpetual, universal peace.

Boundary disputes, whether between individuals or nations, are wont to be long and bitter; and, oftener than otherwise, changes of boundary result from war. Sometimes the result is direct, sometimes

indirect. The bitterness over the Alsace-Lorraine boundary is strikingly in evidence on the continent today. The boundary line between Massachusetts and New Hampshire, surveyed and marked in 1741, has, after a lapse of about 150 years, only recently been accepted. The Alaskan boundary, established in 1825, still drags on, unsurveyed and unmarked, a source of growing irritation and bitterness.

The Disputed Tract.—The tract in dispute comprised an area of about 50,000 square miles. England, with an area of 51,000 square miles, and New York, with an area of 49,000 square miles, is about equal in extent to the territory in dispute.

The tract is bounded on the east by the Essequibo, on the north by the Atlantic and lower Orinoco, on the west by a low, flat watershed separating it from the Caroni, an affluent of the lower Orinoco, and on the south by a mountainous district forming the watershed which separates the streams flowing northward to the Atlantic from those flowing southward to the Amazon. It is included between the 4th and 10th parallels of north latitude and between the 58th and 64th degrees of west longitude. It may be broadly characterized as a low, bench country, buried for the most part beneath a tropical forest of marvelous density and beauty. Lying near the heart of the torrid zone, with the sun passing day after day forever through or near the zenith, and through two rainy seasons of each year furnished for weeks together with downpours of warm rain that suggest a deluge, we have the conditions of nature's own hot-house. From these two conditions of excessive heat and excessive moisture comes the forest covering, which in density, beauty, and variety travelers agree in describing by the word *indescribable*. Beyond the forest tracts there are, in the interior, unforested districts called savannas, which, according to character of soil and altitude, are either swampy, hard and grass-covered, or partially desert. The culminating point of the region is Mount Roraima, about 220 miles from Demerara, on the coast, near latitude 4° and longitude 61°. This mountain is a sandstone mesa whose almost inaccessible flat top is 8,600 feet above the sea-level. Its walls are everywhere cliffs more than half a mile high. From this natural rock fortress the country gently slopes away and then drops in cliffs or benches, so far as we know. In this benched country are deep canyons, with numerous waterfalls—one the Kaieteur fall, on the Potaro, being 900 feet high. Pictures of Mount Roraima and Kaieteur Fall may be seen on the current issue of British Guiana postage stamps.

Guiana is a name that was applied three centuries ago to an extensive and ill-defined tract along the coast between the Amazon and the Orinoco. This has come, in course of time, to be possessed by French, Dutch, and English. The easternmost is French Guiana or Cayenne, whose Devils Island Dreyfus has made famous or infamous. Next west is Dutch Guiana or Surinam, and west of it is British Guiana, formerly the united colony of Essequibo and Demerara. Most of the part yet farther west, which was sometimes called Spanish or Venezuelan Guiana, has been awarded to Great Britain.

Great efforts were made by Spain three centuries ago to conquer and possess Guiana, a region reported and believed to be fabulously rich in gold. On the shores of a vast mythical sea rose a vast mythical town, El Dorado, presided over by a mythical, gilded king. Raleigh sought to conquer this country and its supposed wealth for his queen, Elizabeth; but the Spaniards contested his advance. His son was killed in the assault upon Santo Thomé. He returned to England, was accused by the Spanish minister of piracy, and by order of King James beheaded. But, though he wrote a book about Guiana which set the imagination of Europe on fire, little progress was made in penetrating or exploring it. And why? The answer is easy. The dense forests offered to the white traveler an almost impenetrable barrier. These were traversed by savage animals and yet more savage men, the ferocious, man-eating Caribs. The only practicable route to the interior was by the rivers; but the region is a bench country, rising, as one penetrates it, by a series of steps or benches. Thus it happens that, ascending the rivers (other than the Orinoco), the border land of alluvium on the coast is hardly passed before the traveler meets a cataract or rapid or series of rapids blocking the way. Patiently carrying or dragging his wood-skin canoe through dense woods around the obstacle, he may paddle a short distance against a strong current only to find another cataract and yet another in wearisome succession. To penetrate the interior through the water-soaked and swampy forest jungle is well-nigh impossible. To penetrate it by the streams is only possible in small boats, and then with difficulty and danger. These are the conditions and these the reasons why the world was so long in gaining its small store of knowledge about the interior of Raleigh's wonderland, Guiana.

Origin of Title.—Neither Venezuela nor Great Britain holds in South America by original title. Venezuela derives her title from Spain, a title acquired by war, with resulting conquest and cession. Great

Britain similarly acquired her title from the Dutch by war, with resulting conquest and cession. Venezuela succeeded to Spanish rights and Great Britain to Dutch rights. Thus the arbitral tribunal was engaged in trying the title to a piece of real estate. True, the estate was large; true, the parties were great corporations. Trial to the title of a tract claimed by two states of our Union may be tried before our Supreme Court, but no permanent court exists for trying the title to lands claimed by two nations. The appeal, therefore, has often, in such cases, been to the force of arms rather than to the force of argument. By agreement of the claimants in this case, the matter was to be settled by a battle of brains rather than by a battle of bullets.

Spain's title to the disputed territory is thus stated in Venezuela's case:

Spain first discovered the new world; first explored its continents; first explored, possessed, and settled Guiana, and first firmly established herself in that province as its sole and lawful owner.

Similarly, Venezuela's title is thus stated:

Venezuela revolted from Spain April 19, 1810. On March 30, 1845, Spain recognized Venezuela's independence and formally renounced in her favor all the sovereignty, rights, and claims previously her own in the territory formerly known as the Captaincy-General of Venezuela. Said territory included the region now in dispute.

Such is the Venezuelan title. The British title cannot be so succinctly stated. In very brief, however, it is as follows:

In 1581 the Dutch, then subjects of Spain, revolted and entered upon that long and bloody war which resulted in their independence in 1648. During this war the Dutch, in 1598, made a trading voyage to the Guiana coast. This voyage, made 100 years after the Spanish discovery of this coast, was the *first* Dutch voyage thereto of which we have any definite knowledge. Already Trinidad had been occupied by the Spanish, a Spanish settlement planted on the lower Orinoco, and formal and ceremonial possession taken of Guiana by Spaniards in the name of their King. In June, 1621, was created by the States-General of the United Netherlands the Dutch West India Company. By the terms of its charter no native or inhabitant of the Netherlands was permitted, except in the name of the company, to sail upon or trade with the countries of America and the West Indies, from Newfoundland to Cape Horn and from Cape Horn to Bering Strait. Trade to the New World, without permission of the company, was, by the charter, forbidden to all Dutchmen. The company ex-

isted for 53 years. After several extensions of its charter it finally died in 1674, and a wholly new Dutch West India Company was then created, which lived for 117 years, being finally dissolved in 1791.

Under the original charter of 1621 the company, in or about the year 1626, established a trading post some 50 miles up the Essequibo, at the junction of the Cuyuni and Mazaruni rivers, on a small, rocky islet, which they named Kykoveral, or See-over-all. Here lived a few unmarried employés of the company and carried on with the natives a trade for the dyes of the forest, balsam, hammocks, canoes, etc. There were no colonists, no cultivation, save possibly a bread garden, and no industries, save, probably, fishing for the use of the post. It was a trading post, and was, down to 1648, the sole Dutch occupation of the disputed tract. Under these conditions the long war between Spain and her rebellious subjects ended in 1648. By the treaty of peace at Münster in that year the Dutch achieved their independence. At the same time and by the same treaty Spain agreed that the Dutch should "remain in possession of and enjoy such lordships, towns, castles, fortresses, commerce, and countries of the . . . West Indies . . . and America" as they then held and possessed.

This, then, was the Dutch title, a title which remained Dutch for one hundred and sixty-six years. In April, 1796, Great Britain and the Netherlands being then at war, an English fleet appeared at Demerara and took possession of that river and Essequibo. Possession was held by the English for six years. In 1802, by the peace of Amiens, these possessions were restored to the Dutch. But war broke out again the next year, and Great Britain again took the possession which has since remained unbroken. The war, which broke out in 1803, was terminated by the treaty of London, in 1814, whereby the Netherlands ceded to Great Britain the Cape of Good Hope, in Africa, and the establishments of Demerara, Essequibo, and Berbice, in America.

Such is the Dutch-British title, which may be still more succinctly stated as follows: The Dutch, while subjects of Spain, revolt and squat on Spanish land in America. When the war ends Spain confirms to them the possession they have taken. This possession is afterward, in war, taken from the Dutch by the British. The possession taken by the British is confirmed to them by treaty, and such is the British title.

Schomburgk and His Line.—Much has been heard during this controversy about Schomburgk and his line. A few words, therefore, on this theme.

Robert Hermann Schomburgk was born in Freiburg, Saxony, in 1804, and died in Berlin in 1865, aged sixty-one. Between 1825 and 1830 he was in the United States, first in Boston and later in Richmond, Virginia, where he was in the tobacco business. Failing in this, he went to the West Indies, where he surveyed the island of Anegada. His published observations on the cultivated plants of the West Indies brought him to the notice of the Royal Geographical Society, which in 1834 engaged him to explore in Guiana. He reached Georgetown or Demerara, as it is usually called, for the first time on August 5, 1835, and for nine years thereafter was engaged in exploration and survey work in Guiana. For the Geographical Society he made three journeys, of about six months each, into the interior, and in October, 1839, returned to England. Early in 1840 he published his little book, entitled *Description of British Guiana*. The Geographical Society awarded him a gold medal, the King of Prussia knighted him, and the same year Great Britain engaged the now Sir Robert Schomburgk to survey the boundary between British Guiana and Venezuela. This was not to be a joint survey, but only a British survey, the results to be presented to Venezuela and Brazil as a statement of the British claim. He returned from England to Georgetown in October, 1840, and made three more trips to the interior, now under government auspices. In May, 1844, he took final leave of Guiana and went to Barbados, where he stayed some time and wrote a history of the island. In 1848 he was made British consul at Santo Domingo. In 1857 he was sent to Siam as Her Majesty's Consul-General. In declining health he returned to England in 1864 and retired on a pension. He died in Berlin the following year.

With him during a part of his explorations was his brother, Richard Schomburgk, a trained botanist, who published an interesting account of the Guiana exploration, a work in three stout octavo volumes. Sir Robert, having informed himself as well as the means at hand and his zeal for his employer would allow, proceeded to trace out on the ground a line, setting up posts, blazing trees, and marking them with British insignia. His zeal seems to have overmastered his judgment, and all doubts were resolved in favor of his employer. Why not? Was not his line, after all, only a claim? But, alas, it came later to be treated as a line of right. The Schomburgk boundary survey grievously offended Venezuela. She protested at once, and insisted upon the removal of the marks. To this Great Britain, at length, consented, with the usual proviso that

by such act she waived none of her rights. This survey of 1841 and the resulting correspondence may be regarded as the beginning of the controversy.

In 1841 Schomburgk submitted to Sir Henry Light, the governor of British Guiana, a report setting forth the grounds upon which he laid claim to the Amacura and Barima for Great Britain. This was an official report intended for the public, and was given to the public in a parliamentary paper. On the same day, however, he wrote to Governor Light a *confidential* letter, pointing out the importance to Great Britain of the possession of Point Barima as a point commanding the entrance to the Orinoco River. In this letter he dwelt at length upon the fact that the occupation of Barima meant the commercial and military control of the entire Orinoco region. He also furnished a map showing the line claimed by him for Great Britain. What the Foreign Office thought of Schomburgk's claim I do not know. Certain it is, however, that this map was not made public for many years. The line shown thereon, says Great Britain at the arbitration, is the *only* Schomburgk line—*i. e.*, the only line Schomburgk ever drew. Without assenting to or denying this, it may be remarked that the phrase *The Schomburgk Line* had come to mean, both in popular and official usage, something different from the line on Schomburgk's map that was sleeping, unknown to the public and unknown to some of the officials, in the government archives.

There was published early in 1877, in London, a large, fine map of British Guiana, which has been often referred to as the Great Colonial Map or Great Map of the Colony. The map was engraved and printed by Stanford, of London. It is dated 1875. Its long title indicates that it was compiled from surveys by Schomburgk and corrected to date from surveys by the crown surveyor of the colonies and by the government geologists, Brown and Sawkins. The map bears this note:

The boundaries indicated in this map are those laid down by the late Sir Robert Schomburgk, who was engaged in exploring the colony during the years 1835 to 1839 under the direction of the Royal Geographical Society; but the boundaries laid down between Brazil on the one side and Venezuela on the other and the colony of British Guiana must not be taken as authoritative, as they have never been adjusted by the respective governments; and an engagement subsists between the governments of Great Britain and Vene-

zuela by which neither is at liberty to encroach upon or occupy territory claimed by both.

This map, compiled from official sources and with an explicit statement that it shows the *Schomburgk line*, was accepted as the official map of the colony. When the geologists, Sawkins and Brown, made a geological survey and map of the colony they carried their work to the boundary line shown on this map, and stopped there.

In 1886 or 1887 another edition of this map appeared. There is nothing in its appearance, however, to indicate that it is a second or different edition: the title is unchanged and the date is still 1875, as before; but the note as to the boundary has disappeared and in place of the old line a new boundary, differing materially from the old one, appears, a boundary which enlarges British Guiana and contracts Venezuela. The change, made at the instance of the government, may be regarded as a first publication of the line submitted by Schomburgk in 1840. It is, perhaps, needless to comment on the anger aroused in Venezuela by this publication, or to wonder at their designation of the *caprichosa linea de Schomburgk*. Early in the history of the United States Commission on the Venezuelan Boundary a piece of elastic was sent in bearing the printed words *Schomburgk line*.

Thus much for Schomburgk and his line, of which little was said in the arguments of counsel for Venezuela at the arbitration. Whatever temptations the story offered for unkind words, those temptations were resisted, and the arguments were maintained upon a plane commensurate with the great cause and the great tribunal designated to try it.

Diplomatic Correspondence.—The story of the correspondence between the governments touching their boundary is too long and tangled for recital here. Suffice it to say that there were proposals and counter-proposals, all of which proved fruitless. No agreement was reached. Several times Venezuela proposed arbitration, and several times Great Britain refused arbitration. In October, 1886, the British Government inserted in the *London Gazette* a notice reciting that information had come that Venezuela had made grants of land in the disputed territory, and declaring that such grants would not be recognized. The notice continued as follows:

"A map showing the boundary between British Guiana and Venezuela, claimed by Her Majesty's Government, can be seen in the library of the Colonial Office, Downing Street, or at the office of the government secretary Georgetown, British Guiana."

What map this was does not appear, but it was at about this time that the second edition of the Great Colonial Map appeared, the map bearing the expanded Schomburgk line. Prior to this notice, viz., in March, 1885, the British minister had commissioned two rural constables for the Amacura River, and in August, 1886, a British post was established on that river. Venezuela protested, and in January, 1887, demanded the immediate evacuation of the territory between the Amacura and the Pomeroon. This was not complied with, and Venezuela then broke off diplomatic relations. For ten years thereafter fruitless attempts were made to settle this old and irritating dispute. Meanwhile, and as early as 1886, the United States had manifested its interest in the question by offering to Great Britain its good offices in the matter. Finally, in February, 1896, after the famous Cleveland message of December, 1895, were begun the negotiations which led to the treaty of arbitration, which in turn ended the long dispute.

United States Intervention.—Mr Olney, Secretary of State in 1895, following up a correspondence begun as early as 1886, corresponded with Great Britain with a view to bringing about a settlement of the boundary question. This correspondence was, on the part of Mr Olney, direct, vigorous, logical, and forceful. In due time, which means several months, came, late in 1895, Lord Salisbury's careful, courteous, diplomatic, and dignified reply, again declining to arbitrate. Thereupon promptly followed Cleveland's message to Congress, a message wherein, after briefly summarizing the situation, he said that, having sought in vain to induce a just settlement by impartial arbitration and being finally apprised of Great Britain's refusal to so settle, nothing remained but for the United States to determine for its own purposes where was the true divisional line between Venezuela and British Guiana. He thereupon recommended that a commission of five be appointed to investigate and determine the true divisional line between Venezuela and British Guiana, and that an adequate appropriation be made for its use. Then followed these weighty and significant words, whose power to thrill has not yet vanished: "When such report is made and accepted, it will, in my opinion, be the duty of the United States to resist by every means in its power as a willful aggression upon its rights and interests the appropriation by Great Britain of any lands or the exercise of governmental jurisdiction over any territory which, after investigation, we have determined of right belongs to Venezuela." Within four days from the writing of this

message its recommendations had been enacted into law, and almost, if not quite, without parallel, not a single vote was recorded against it in either house. What stronger evidence of its non-partisan character is possible? And yet only last week a prominent London newspaper could say:

"We were brought to the verge of war four years ago for the sake of Mr Cleveland's reëlection, and a pretext for a diplomatic quarrel will never be wanting when the anti-English elements of the Republic have to be conciliated."

Thus, in January, 1896, was born the United States Venezuelan Boundary Commission, composed of David J. Brewer, Associate Justice of the Supreme Court of the United States; Richard H. Alvey, Chief Justice of the Court of Appeals of the District of Columbia, a skilled Spanish scholar; Mr F. R. Coudert, a distinguished member of the New York bar and of counsel for the United States in the Bering Sea case; Dr D. C. Gilman, geographer, president of Johns Hopkins University, and Dr Andrew D. White, historian and diplomatist. As its chairman, the commission chose Judge Brewer, and as secretary Mr S. Mallet-Prevost, of the New York bar, a thorough Spanish scholar and trained lawyer. Thus jurists, lawyers, and scholars composed the United States Commission, which organized forthwith, established an office in the Sun Building, on F street, and began investigation. Floods of information were poured in upon it, and floods of applications for employment. For a few weeks its work was the leading news item of the British and American press. To its aid it invited scholars—Justin Winsor, of Harvard College, distinguished for his great work on American history and cartography; Prof. J. Franklin Jamison, of Brown University, especially familiar with the history of the Dutch in America; and especially did it summon Prof. George L. Burr, of Cornell University, upon whom fell most of the historical research work. I have not ceased to marvel at the amount and excellence of the work done and results achieved by him. For aid in geographic matters the commission came to the Geological Survey, availing itself of the special knowledge of several of the experts in that office. After preliminary studies the work was organized, and Professor Burr went to Holland and to London to study the Dutch records. Here he was joined later by Mr Coudert. The secretary made, in the Harvard library, a special study of the maps of the region, and similar studies were carried on in Washington. It is not too much to say that the studies thus conducted threw much new light on the question; that supposed facts were in some important

Mr S. Mallet-Prevost Dr D. C. Gilman Dr Andrew D. White

Chief Justice Richard H. Alvey Justice Brewer Mr F. R. Coudert

THE UNITED STATES VENEZUELAN BOUNDARY COMMISSION, 1896-'97

instances shown to be not real facts, and that consequently neither Great Britain nor Venezuela was master of its own case. Rarely, if ever, has a great case been sifted or studied with more thoroughness, impartiality, or care.

Meanwhile the diplomatic correspondence was proceeding with its usual deliberation, secrecy, and silence. It came to be seen that a finding adverse to Great Britain would produce an awkward situation. What influences were potent to bring about what actually resulted I cannot say, nor would it be wise to say if I could, but the result every one knows was an announcement by Lord Salisbury at the Lord Mayor's dinner in London, in November, 1896, that negotiations were in progress and so far advanced that he was justified in believing that a satisfactory solution of the much-vexed boundary question was about to be reached. This courteous and diplomatic statement meant arbitration, the arbitration which finally concluded, at Paris, on the 4th of last October, this ancient quarrel. Some three months after Lord Salisbury's announcement, to wit, on February 2, 1897, Sir Julian Pauncefote for Great Britain and Señor José Andrade for Venezuela signed in Washington a treaty of arbitration. That done, nothing remained for the United States Commission but to close its work and disband. The work of determining the boundary now passed on to the new tribunal constituted by the treaty.

The United States Commission had gathered a large amount of material useful for determining the question. Accordingly, in closing its work it prepared a brief report of its operations and accompanied it by appendices containing the material collected. This report consists of three octavo volumes and an atlas containing 76 maps, the whole constituting a distinct contribution to knowledge along geographic and historical lines.

The Arbitral Tribunal.—By the treaty there was constituted a tribunal of five jurists, composed of Lord Herschell and Lord Justice Collins, two of the foremost judges in Great Britain; Judges Fuller and Brewer of the Supreme Court of the United States, and the fifth to be chosen by those four. The English submitted the names of several jurists acceptable to them. Similarly, the American jurists submitted names of several jurists acceptable to them. In both lists was found the name of F. de Martens, a distinguished Russian writer on international law, and he was chosen as the fifth arbitrator. Before the case came to trial Lord Herschell died and was succeeded by Lord Russell.

On March 15, 1898, each party submitted in print its case, with accompanying papers. Venezuela's case was contained in three vol-

Justice Brewer Lord Russell Prof. Martens Chief Justice Fuller Lord Justice Collins

THE PARIS TRIBUNAL, 1899

umes and an atlas, Great Britain's in seven volumes and an atlas. Four months later, on July 15, 1898, each submitted its counter-case. Venezuela's counter-case made three volumes and an atlas, Great Britain's two volumes and a portfolio containing six maps. Four months later, on November 15, 1898, each submitted its printed argument, Venezuela's being contained in two volumes and Great Britain's in one. The formal sittings for hearing the oral argument began in Paris, June 15, 1899, and lasted through fifty-four sessions of four hours each, ending on the 27th of September. Just one week later, on October 4, 1899, the unanimous award of the tribunal was presented, and a controversy which had lasted for fifty-eight years, which had brought three nations to the very verge of war, was over.

Great Britain was represented by four counsel, Sir Richard E. Webster, Attorney General; Sir Robert T. Reid, ex-Attorney General; Mr G. R. Askwith, and Mr Rowlatt.

Venezuela was represented by Gen. Benjamin Harrison, ex-President of the United States; Mr S. Mallet-Prevost, formerly secretary of the United States Venezuelan Boundary Commission; Gen. Benjamin F. Tracy, and Mr James Russell Soley.

Sir Richard opened for Great Britain in a speech lasting thirteen days; Mr Mallet-Prevost followed for Venezuela in a speech of thirteen days. Finally Sir Richard closed for Great Britain and General Harrison for Venezuela. Can I be mistaken in thinking General Harrison's argument much the stronger one? The speeches were reported in shorthand and printed from day to day, the whole making eleven folio volumes.

The Award.—The award was completed and signed October 3, 1899, and is signed by all the judges. It is a short document, making only about half of an ordinary newspaper column. After reciting in legal phrase the creation of the tribunal, its membership, and its duties, it declares:

"Now we, the undersigned arbitrators, do hereby make and publish our decision, determination, and award of, upon, and concerning the questions submitted to us by the said treaty of arbitration, and do hereby, conformably to the said treaty of arbitration, finally decide, award, and determine that the boundary line between the colony of British Guiana and the United States of Venezuela is as follows:

"Starting from the coast at Point Playa, the line of boundary shall run in a straight line to the River Barima at its junction with the River Mururuma and thence along the midstream of the latter river to its source and from that point to the junction of the River Haiowa

with the Amakuru and thence along the midstream of the Amakuru to its source in the Imataka Ridge and thence in a southwesterly direction along the highest ridge of the spur of the Imataka Mountains opposite to the source of the Barima and thence along the summit of the main ridge in a southeasterly direction of the Imataka Mountains to the source of the Acarabisi to the Cuyuni and thence along the northern bank of the River Cuyuni westward to its junction with the Wenamu and thence following the midstream of the Wenamu to its westernmost source and thence in a direct line to the summit of Mount Roraima and from Mount Roraima to the source of the Cotinga and along the midstream of that river to its junction with the Takutu and thence along the midstream of the Takutu to its source, thence in a straight line to the western point of the Akarai Mountains and thence along the ridge of the Akarai Mountains to the source of the Corentin called the Cutari River."

In this award are involved two things: *first*, the sovereignty of a tract of country claimed by two nations; *second*, international arbitration as a mode of settling such disputes. As to the *first*, the award is clear, sharp, and decisive, though it will be contrary to general experience if difficulties of interpretation do not arise when the line is surveyed. As to the *second*, viz., the international arbitration of such questions, this is strengthened by a unanimous award, but weakened by the absence of a written opinion setting forth the facts and principles upon which the award was reached. As the common law has grown up and been established by the opinions of great jurists dealing with great cases, so here was, it seems to me, an exceptional opportunity to expound and establish principles of international law that would be most helpful in the future. The award is obviously the verdict of a widely disagreeing jury, which finally compromises on a line satisfactory to none. Such a decision concludes the particular dispute, but affords little light for the future.

In theory, principles of international law control; in fact, compromises control. The award is on its face a compromise. Moreover, on the day on which it was published there was cabled to America an interview with Justice Brewer, in which the reporter quotes him as saying:

"Until the last moment I believed a decision would be quite impossible, and it was only by the greatest conciliation and mutual concessions that a compromise was arrived at. If any of us had been asked to give an award, each would have given one differing in extent and character. The consequence of this was that we had to adjust our different views, and finally to draw a line running between what each thought right."

Courts, other than criminal, are constituted to settle disputes—justly if possible, but to settle them; and so this august tribunal has settled this old and irritating dispute peacefully, lawfully, and I wish I could add, justly. Contrasted, however, with any other device for settlement, arbitration is the best practical mode yet devised, and is cheap. Last week a statement of the expense in the case of the Venezuelan Boundary Arbitration was presented to the House of Commons. The cost to Great Britain from 1895 up to last week was £65,625, or about $320,000. The cost to Venezuela is not published, so far as I know, but is probably not less. The appropriation by Congress for the United States Commission was $100,000. So that the total cost to the nations involved in a fierce and hot dispute, lasting four years, conducted by peaceful means, was about three-quarters of a million of dollars, equal to war expenses for about one day. In the way of cost, then, arbitration is most economical; and as to *justice*, Venezuela gets not all she desired, but she does get control of the mouth of her great river, the Orinoco. Former British ministries had recognized the justice of her claim to this, and had proposed to cede to Venezuela this Orinoco mouth; but since the British moved forward into this tract some fifteen years ago and took possession by establishing police stations, issuing mining and timber licenses, etc., Venezuela's efforts to induce her to withdraw from the Orinoco mouth have been unavailing. Nor could she drive her out. By the arbitration, therefore, Venezuela, the weaker power, gets something which is of much value to her, which she has always prized, which Great Britain possessed herself of and the title to which she refused to arbitrate until after intervention. The very pith of the award lies in the possession and control of the Orinoco mouth. That Venezuela gets this is to my mind an act of justice and a triumph for arbitration, which does much to reconcile to a decision which I wish were in all respects as just as this.

But the European and American view of American questions is far apart. As to prior rights resulting from discovery, occupation, etc.; as to rights based on relations with the aborigines; as to the nature, extent, and effect of political control—respecting all these, America and Europe are far apart. Jurists of the highest ability and integrity are certain to find themselves holding irreconcilable views. All this is most significant and should never be lost sight of when arbitration is proposed as a mode of settlement.

KOREA — THE HERMIT NATION

By Commander Harrie Webster,

United States Navy

Korea—called by several writers "The Hermit Nation" and by its inhabitants Cho-sen, the Land of the Morning Calm—is that singular country in eastern Asia which stretches south from the elevated plains of Manchuria, and is bounded on the east by the Sea of Japan and on the west by the Yellow Sea. Its area of approximately 80,000 square miles sustains a population of some 12,000,000; but in both geography and population much is necessarily left to the imagination, for an accurate knowledge from any point of view is yet to be obtained.

The historical records also are meager and tinged with the Oriental tendency to assert as facts much that cannot be proven. Situated as she is, between two nations, each jealous of the influence and favor of the other, it has been her unfortunate fate to suffer attack and outrage from China and Japan in turn. She has been a battleground for centuries.

The physical characteristics of Korea have been aptly described by an English traveler as "a sea suddenly congealed during the progress of a gale of wind." The mountainous character of the country can only be appreciated by actual experience. The traveler is always certain that from the top of the next mountain plains and level ground will be disclosed; but no such good fortune awaits him, for the sole outlook from the ridges of Korea is upon other mountains, which in turn conceal still others. It has been said there is no level land in the country, and this is almost literally true.

As a natural result of the lack of plains, the rivers are frequent and small, the Han being perhaps the most important. At the mouth of this fine river is Chemulpho, and some 60 miles farther up, the capital, Seoul; but navigation between the two points is very difficult, as the tremendous tides along the coast exercise an influence even above the capital city.

The Han River is wild and picturesque, the numerous bends and rapids giving it a character unique for this part of the globe, where the vast alluvial plains of the Chinese Empire remind one of the

prairies of our western territories. The trip from Chemulpho to Seoul takes an entire day, a day fraught with incident and accident from start to finish. Numerous ruined forts, partly demolished walls, and picturesque villages lend an air of antiquity to the prospect, well seconded by the dress and character of the people.

The traveler has no definite means of transportation except those furnished by nature, and called in our own country "Shanks' mare." The wealthier officials, it is true, have sedan chairs, borne by four or

A VILLAGE IN KOREA — THE HAN RIVER IN THE DISTANCE

six men, but beyond this and an occasional saddle-pony the average Korean does his traveling on foot, and it is marvelous to contemplate the distances which can be covered by one of the native runners when engaged on government business.

The roads are even poorer than the means of traveling over them, and from the writer's experience it is evident that no attention has ever been given to laying out, making, or repairing roads in the kingdom. The wandering bridle-paths doing duty for roads spread

aimlessly over the landscape, changing direction with the seasons, but crowded with travelers at all seasons of the year, for the Korean is a restless being, and the custom of his country enables him at sundown, when the day's travel comes to an end, to accept the unquestioning hospitality of the nearest family. During the rainy season—October and November—these roads are almost impassable by reason of mud, and many of them become rushing torrents of water.

The climate is not very different from that in similar latitudes in the United States, from New York to North Carolina. At Chemulpho,

TWO KOREAN TRAVELERS

the principal seaport of the country, snow falls frequently from December to February, but does not remain on the ground for any length of time, owing to the proximity of the two seas bordering it on the east and west. The winter season, however, becomes very tedious by reason of the persistent winds which find their way through the innumerable gorges, chilling the traveler to the bone and rendering comfort impossible. They start far away to the north among the mountains and plains of Manchuria and sweep across the Korean peninsula with great force. It is for protection against the winds that the Korean tiger, that singular exotic from tropical regions, wears a thick coat of fur in place of the thinly distributed hair with which we are accustomed to see his Bengal brother clothed. In northern Korea rich harvests are gained by hunters of the smaller fur-bearing animals, such as squirrels, martens, and foxes, which find their principal market in China, a few of the poorer sorts going to Russia.

One of the striking objects in every landscape is the immense number of graves clustering on the sides of hills and in the neighborhood of groves of evergreens. On casual inspection these graves appear to be simple circular mounds of earth, varying in size according to the importance of the person buried and scattered without plan or order; but a careful examination of several hundred graves has convinced me that instead of being arranged subject to the whim of the survivors a very definite plan is followed, not only in their shapes, but in their disposition and arrangement. I found them, without exception, following the outline of the tortoise. So much care is bestowed upon this fancy that even the serrations of the shell and the flimsy tail possessed by the animal are carefully wrought out in these mementos of the dead.

Trees are generally planted in close proximity to a favorite cemetery, and it is looked upon as an act of desecration to destroy a tree standing near a grave. Respect for ancestors takes a curious direction here. While it is not unusual to hear one's father reviled in no measured terms without inciting anger, if so much as a pebble is cast at the grave of that father blood alone can wipe out the affront.

In appearance the Korean differs materially from his neighbors, the inhabitants of China and Japan, the coloring matter in his skin belonging to a different class from either. In common with them, however, his hair is black, straight, and coarse, and it is rarely that a bald Korean is seen. Their eyes do not have the slanting appearance

noticed in their neighbors, and the aquiline nose is not a rarity. Unlike the Japanese, however, the Korean does not wear his hair short, but apparently lets it grow from youth to old age with no attempt at clipping or trimming.

The Korean boy, up to sixteen years of age, is generally a delight to the eye. With his large, wide-open eyes, smooth skin, plump cheeks, and hair plaited down the back and parted in the middle, he has been compared to an angel. As the years advance, however, his

A HOUSE IN KOREA

beauty gives way to the coarseness and stolidity which have become national traits, and by the time the boy becomes a man the angel has disappeared, to be replaced by a very commonplace human being.

Girls and women, except of the laboring class, are seldom in evidence, and those of whom one gets glimpses are not very prepossessing, but so far as my observations extended they are plump and well kept, and if it were not for the plainness of the method of hair-dressing would be regarded as quite interesting in appearance. As may

be seen from the illustration, the Empire type of dress is adopted, giving them somewhat of a stumpy, high-shouldered appearance.

The Korean girl wears beneath her dress, encircling her bust, a swathing of two or three thicknesses of some thin material, which is drawn tightly about that portion of the female anatomy to which nature generally gives no little prominence, with the result that all Korean girls are flat-breasted. This fashion of compressing the bosom is continued until marriage, when the opposite extreme is adopted, and the bosom is exposed in a horizontal line by the curious arrangement of the little jacket, so that a nursing baby has no impediments to displace in his search for food. Babies are cared for after the style of Japan, and seem to be as happy and as well pleased with life. Owing to the miserable sanitary conditions existing in the Korean domestic arrangements, the mortality among children is said to be very high. Those who survive are literally the fittest for the battle for existence.

A GROUP OF KOREANS

The first object to strike the visitor to the Land of Morning Calm is the clothing of the inhabitants. The universal adoption of white, the singular hats, the foot-gear, all tend to impress upon the stranger the fact that he is in a part of the world which is uncontaminated by the customs of western civilization. The peculiar hats, shown in the illustration, are made of horsehair for the wealthy wearer and of finely split bamboo for his poorer brother; but beneath the hat proper is a sort of cap of the same material and so shaped as to protect the curious little topknot into which the hair is gathered after marriage. The band of this under cap is drawn tightly about the brows, oftentimes inflicting severe headaches upon the wearer. The other type of head covering shown is made of rice straw and is worn by country people and mourners.

The material of their white clothing may be either cotton, silk, or the so-called grass-cloth of China. The larger part of the cotton material used in the country is woven in Japan, but the silk and grass-cloth are frequently the product of domestic looms.

Many years ago—long before the "western barbarian" reached the shores of Cho-sen—the Koreans were noted among their Chinese and Japanese neighbors for the skill and taste displayed in textile manufactures, and the products of their looms could be found side by side with their pottery in all the markets then open in the East.

By the slow but sure degradation of wars, insurrections, and invasions manufactures and arts in Korea gradually lost their value in both quality and quantity, until today her people, rich and poor alike, are dependent upon China and Japan for a large percentage of their clothing and pottery.

There is, however, one branch of manufacture, the working of bronze, in which the Hermit Nation easily leads, the use of this metal for domestic purposes being peculiar to this country. The bronze, which is of good quality, hard, and takes a good polish, is of an alloy of copper and tin, with a small per cent of zinc and a trace of iron. The bronze spoons, with which every family is liberally supplied, are models of grace, as are the hibachis or fire-pots, which are largely exported to Japan. These graceful bronze bowls are applied to every domestic use imaginable, in the kitchen for eating purposes and in the sleeping-rooms. The same material is used in the manufacture of the tobacco pipes in universal demand, and much taste is displayed in their ornamentation.

From the regularity and finish of these various bronze articles it is difficult to believe that the tools employed are scarcely an advance on those of two thousand years ago. For a lathe the Korean artisan uses an apparatus propelled by his feet as he sits on the ground, the motion being but a half revolution in each direction, while the turning tool is held in the hand. Necessarily the process is a slow one, but, as is common with all Orientals, time is no object, and the work turned out by these crude and archaic processes would do credit to an American workshop.

Recent investigation has shown that Korea is rich in many of the better class of minerals, gold, silver, copper, iron, and coal. The gold is almost solely in the more northern part of the kingdom and is associated in many cases with silver. A peculiarity of the gold mined is its intense yellow, resembling, in this respect, the flake gold winnowed from the sands of the African Gold Coast. The coal measures have not been very accurately exploited, but so far the output, which has been entirely by native enterprise and labor, is a fair bituminous and of considerable extent. The great and principal drawback to the prosecution of mining lies in the inaccessibility of the country to modern methods of transportation, as its physical characteristics preclude development on modern lines. Little is known of precious stones, for this form of personal adornment is not much in vogue among the Koreans, and few attempts have been made to develop the industry.

In religion the Korean must be marked with a minus sign. To all appearances he has none. There are, however, several Buddhist temples and monasteries in and around the city of Seoul. The only temple I had an opportunity of visiting while at the capital was that devoted to the god of war, and the edifice does not differ in any respect from Buddhist temples elsewhere.

As an architect, the native of Cho-sen, in times past, seems to have shown much skill in construction and boldness in design, several of the city gates of Seoul indicating artistic ability and a desire for impressiveness. The great south gate is a remarkable piece of work, and the fact that it is still in use as an entrance to the city shows the excellence of its construction. The north gate is built of carefully hewn granite blocks, and is as well proportioned and as true, from an architectural point of view, as though erected yesterday in commemoration of a modern victory. Granite seems to have been a favorite

GUARDIAN OF THE TEMPLE OF THE GOD OF WAR

material for the stone-workers of the country. The delicacy of treatment shown in the huge dogs guarding the palace gate and the skill shown in the picture of the guardian of the temple of the god of war confirm the Korean boast that from them Japan and China received a large part of their skill and taste in art. However this may be, it is undeniable that Korean art must have been at one time of high character.

One of the objects of interest in Seoul, and, though in audible evidence each day, seen by few foreigners, is the great bell. Unlike the great bell of Moscow, the big bell of Seoul, said to be third in size in the world, is as perfect today as when first cast, and as the centuries roll by its tone grows mellower and more musical. It hangs in its original tower, in the center of the city, where its sonorous boom fills the air to all parts of Seoul and has opened and closed the gates of the city for nearly five centuries.

AN EXAMPLE OF KOREAN ART

In shape and general outline it is of the Japanese type. In fact, the Korean claims that the bells of Dai-Nippon have been modeled after those of Korea. The quality of the bronze was so excellent that the metal filled every mark in the mold, reproducing with perfect fidelity the delicately cut, classical Chinese characters forming the inscription: "Sye Cho the Great, Twelfth Year Man Cha (year of the cycle) and Moon, the fourth year of the Great Ming Emperor Hsüan-hua (A. D. 1468), the head of the Bureau of Royal Despatches, Sye Ko Chyeng, bearing the title Sa Ka Chyeng, had this pavilion erected and this bell hung."

The condition of the bell is perfect and the method of sounding it, with blows from a suspended beam, has no tendency to injure it, as does the more modern metallic tongue or clapper. Gongs are seen everywhere in this country, and, though hardly credible, many of them are sweet-toned and harmonious.

Twenty years have elapsed since the Hermit Nation opened its doors to the representatives of western civilization. Its progress in some directions has not been inconsiderable. Already the American trolley car runs beside the great bell and the first steam railroad in the kingdom is approaching completion under American supervision, with American material, and backed by American capital.

The political and commercial future of this interesting country will be watched with a widespread interest, and no people will extend a more willing and disinterested hand than the people of the United States of America.

THE GREAT SOUTH GATE OF SEOUL

AN ASSUMED INCONSTANCY IN THE LEVEL OF LAKE NICARAGUA; A QUESTION OF PERMANENCY OF THE NICARAGUA CANAL

By C. Willard Hayes,

U. S. Geological Survey

A paper under the above heading by Prof. Angelo Heilprin appears in the *Scientific American* of February 24, 1900. To one not familiar with the investigations which have been carried on in this portion of the isthmian region, the conclusions reached by Professor Heilprin appear to have some foundation; and since they cast a doubt upon the feasibility of the proposed Nicaragua Canal and on its permanence after construction, the questions raised are of sufficient importance to be answered somewhat fully.

Stated very briefly, Professor Heilprin's premises and conclusion are as follows: In 1781 the Spanish engineer Galisteo determined the altitude of Lake Nicaragua to be 133.11 feet above low water in the Pacific. Later, in 1838, Lieutenant Baily ran a line of levels from the Pacific and made the altitude of the lake surface 128.3 feet above low water at San Juan del Sur on the Pacific. In 1852 Colonel Childs surveyed a route for an isthmian canal and determined the elevation of the lake to be about 108 feet above mean sea-level. Subsequent determinations by Lull in 1873, Menocal in 1885, the Maritime Canal Company in 1890, and the Nicaragua Canal Commission in 1898 have reached substantial agreement as to the elevation of the lake, making its mean about 104 feet above mean tide in the Pacific. This discrepancy of 20 to 25 feet between the earlier and later determinations of the lake level has generally been ascribed to the inaccuracy of the earlier surveys. Professor Heilprin, however, concludes that the earlier determinations were correct, and that the level of the lake has subsided that amount between the dates of the earlier and the later surveys. It will readily be seen that a region subject to a change in elevation of 20 feet in a period of 14 years (between 1838 and 1852) would offer serious obstacles to the construction of a canal of the magnitude of the one proposed or to its permanency after construction.

Three causes, singly or in combination, might bring about a change in altitude of the lake surface: (1) A depression of the whole of this

portion of the isthmus without warping; (2) a depression of the lake basin by warping, the sea margins remaining constant; (3) a cutting down of the lake outlet.

(1) If the whole isthmian region had undergone recent subsidence, the evidence of such a change would be manifest at the coast. Greytown is located upon a low sandy beach, which was thrown up by the surf, and has within the past century been cut off from the sea by a sand spit which inclosed first a harbor and then a closed lagoon. This land has not been added to since it was exposed to the surf early in the century, and any change in elevation, even of a few feet, would be quickly apparent and would be a matter of record. The surface of the San Juan deltaplain ascends from the margin of the sea with a regular gradient merging at its inner margin with the floodplain, as determined by the volume and load of the river. This regular gradient precludes the possibility of any recent change in altitude of this region. Even a slight subsidence would permanently flood extensive areas, and a corresponding rise would cause the streams to deepen their channels so that the flood waters would no longer overtop the banks.

The same evidence of stability is in general true of the Pacific coast. The streams flowing to the Pacific from the divide opposite the southern end of the lake occupy, in their lower courses, drowned channels which have been more or less completely silted up. Any recent depression of the coast would have flooded these alluvial valleys and produced irregularities in their gradient. No such flooding is observed, but, on the contrary, unmistakable evidence that present conditions have prevailed for a considerable time, certainly for several centuries. In the vicinity of Corinto, on the Pacific coast, northwest of the depression which holds lakes Nicaragua and Managua, there has been a recent subsidence of a few inches, and this is well recognized by the people of the region, and its amount has been determined by the engineers of the railroad which runs from Corinto to Momotombo. This shows that rapid changes of level even of small amount are quickly recognized, and that a depression of 20 feet of any occupied portion of the coast could not possibly escape notice.

(2) Lake Nicaragua is about 100 miles long and 45 broad. It formerly extended eastward at least 25 miles farther to the present position of Castillo Rapids. Now it has been shown above that the coast on either side of the isthmus, at least opposite the southern end of the lake, has not suffered recent subsidence. A depression of the

lake basin itself sufficient to produce a decrease in the altitude of its surface amounting to 20 feet would almost certainly have produced more or less tilting of the surface by the subsidence of some portions of the lake's perimeter more than others. It is quite inconceivable that the region should have been warped in such a manner that the lake shore at Las Lajas should be lowered 20 feet, while the Pacific coast, only 12 miles distant, was not affected, and that at the same time every part of the lake shore should also be depressed an exactly equal amount. But if the basin had been unequally depressed, some portions of the shore would be drowned, while at other points the lake bottom would be laid bare, and raised beaches left at the former shore line. Nearly the entire circuit of the lake was made by the writer, and its shores were carefully studied with the object of determining whether or not there existed any evidence of recent changes in level. Owing to the regularity of the winds which prevail in this region, the different portions of the lake shore present wide differences in character, but there is everywhere a nice adjustment of shore features to present conditions. At the lower end and along the northeastern side, where there is generally an offshore wind and consequently no surf, the streams have built extensive deltas out into the lake, and the surface of the deltaplains and floodplains is regulated by the fluctuations in height of streams and lake due to seasonal changes. A depression of 6 feet relatively to lake level would permanently flood these deltaplains, while an elevation of equal amount would raise them above flood level and start the streams to deepening their channels and building new deltas at lower levels.

Along the southwestern side of the lake there is a rather heavy surf throughout the greater part of the year. Wave erosion is therefore progressing more or less rapidly, according to the character of the rocks. The width of the beach between the water margin and the base of the wave-cut cliff is everywhere perfectly adjusted to the seasonal fluctuations in level and the character of the materials in which the cliff is cut. Any recent change in the relation of lake level to shore would necessitate a readjustment of these conditions. An elevation relatively to lake level would have raised beaches above the reach of the highest flood water. A depression would drown the beach and start the waves to cutting at a higher level. Nothing of this kind was found, and it is certain that the relations of lake level to land have not suffered recent change on this side of the lake. The changes at the upper end of the lake, in the vicinity of Tipitapa River, cited by Professor Heilprin, will be discussed later.

(3) A third way in which the level of the lake might have been lowered is by the cutting down of its outlet. As fully explained in the report of the Canal Commission, 1897–'98, it appears probable that the level of the lake was early in its history determined by a rock sill over which the Rio San Juan flowed at Castillo. This sill has since been cut down somewhat, and the lake level is now held by the delta of the Rio Sabalos which forms the Toro Rapids. From the point where it issues from the lake to the Toro Rapids the Rio San Juan meanders through an alluvial plain, which represents a former extension of the lake silted up by tributary streams except for the channel kept open by the outflow from the lake. The surface of this plain stands at such a level that it is just covered by the streams when in flood. In other words, it has the character of a growing floodplain and proves conclusively that present relations have held for a considerable time. Any lowering of the lake level by cutting down the outlet would at once leave this alluvial plain above the reach of floods and completely change its character. As has already been pointed out, the sill which holds the lake at its present level is a delta deposit, and it will not long resist corrasion of the waters which cross it; so that in a relatively short time, as geological changes go, the river may be expected to begin the rapid trenching of its upper channel and eventually, unless artificially checked, lower the lake level.

The evidence that the lake level has not been lowered by this third method is, of course, confirmed by the absence of raised beaches about the lake, where they would certainly be a conspicuous feature if the change had taken place as suggested.

Changes in the conditions of the upper end of Lake Nicaragua have been cited by Professor Heilprin as evidence of recent lowering of the lake's level. This doubtless arises from ignorance of the peculiar physical conditions which prevail there. As stated above, the constant trade winds which sweep across the lake produce a heavy surf along its southwestern margin throughout the greater part of the year. The oblique direction at which the waves strike the shore sets up a strong littoral current, by which the sand is transported toward the northwest and deposited at the end of the lake. A sand spit 10 miles in length has been built across the point of the lake, cutting off a broad, shallow lagoon and crowding the Tipitapa River to the extreme margin of the valley. From the rate at which the shore in the vicinity of Granada is being cut away and at which

the materials are being transported northward, it is easy to understand how rapid changes might take place in the character of the Tipitapa River and convert it in a few years from a deep estuary to a shallow lagoon. The amount of water passing through the Tipitapa River is entirely independent of the elevation of Lake Nicaragua, since it depends wholly upon the relation between rainfall and evaporation in the basin of Lake Managua. Changed conditions at the head of the lake therefore do not in any way support the contention that the level of the lake has fallen in recent times.

It might be inferred from Professor Heilprin's article that Lake Nicaragua is in the heart of a volcanic region subjected to frequent destructive earthquakes. This subject of volcanism and the probability of earthquakes of sufficient intensity to injure canal structures is fully discussed in the recent report of the Canal Commission. It need only be stated here that the canal region lies midway between the Costa Rican volcanoes to the south and the Nicaraguan volcanoes to the north, and that the volcanic activity in both these groups is evidently on the wane. No earthquake of destructive violence has visited the canal region since its occupancy by the Spaniards, and the two centers of the moderate seismic activity, namely, Irazu on the south and the Maribios Range on the north, are respectively 60 and 100 miles from the nearest portions of the canal route.

The quotation from the English engineer Colquhoun indicates that the latter was a superficial observer whose conclusions were drawn from a relatively short period of observation. It is quite true that the amount of water flowing in the lower San Juan is becoming smaller each year, but this is due to a corresponding increase in the Rio Colorado, which is now the main distributary from the head of the delta to the sea. This successive transfer of the main channel to more southerly distributaries has been fully discussed in the report above cited. Even between the head of the delta and the mouth of the San Carlos one is impressed in the dry season with the insignificant volume of the Rio San Juan, and if one's observations were confined to this period he might readily believe that a permanent diminution in the volume of the stream had taken place. This, however, is merely a seasonal fluctuation.

Professor Heilprin's citation of the fluctuation in altitude of various lakes, as Great Salt Lake and Lake Tanganyika, has no bearing whatever upon the question, since these are inclosed lakes and the observed great fluctuation of their levels is directly connected with cycles of

climatic change. The fluctuations in level of Lake Nicaragua due to seasonal changes have been fully discussed by Chief Engineer Wheeler and Hydrographer Davis in the report of the Canal Commission. This fluctuation possibly reaches an extreme range of 14 feet, although the ordinary range is undoubtedly less than 10 feet. With the rise in its surface due to extraordinary precipitation, the section of the outlet increases so rapidly that the balance is soon reached between inflow and outflow, and it is therefore impossible for the level of the lake to reach the elevation given by Lieutenant Baily merely by reason of heavy precipitation. It appears, therefore, in view of the consistent physiographic evidence, that notwithstanding these earlier determinations the level of Lake Nicaragua has remained constant except for slight seasonal fluctuations, at least for a period whose length has to be measured in centuries; and, furthermore, it appears that the geologic conditions in this portion of the isthmus are such that they afford a promise of future stability, and that the region is therefore favorable for the construction and maintenance of a work such as the proposed Nicaragua Canal.

THE ISTHMIAN CANAL COMMISSION

Three hundred surveyors and engineers are at present in the field in Panama and Nicaragua working for the Isthmian Canal Commission. They are examining with the greatest care the Nicaragua route, the Panama route, and all other routes suggested by any of the former surveys. There are also in the field a number of exploring parties in the hope of discovering sites that have been hitherto overlooked. To quote a member of the commission: "Our object is to do the work with such thoroughness that our results cannot be questioned at any future time. We have the reports of all previous surveys, but we shall cover every mile of ground through which we think it possible for the canal to be run. The country is varied and the work of the surveyors is difficult and progresses slowly, especially in the section about Darien. For this reason it is impossible to set even an approximate date for presenting our formal report to the State Department. Unless Congress especially requires one, we shall submit no preliminary report. Until our work is done, therefore, it is improper for any member of the commission to speak in regard to the merit of the several routes proposed."

"The present Panama Company," states Mr Edward Noble, of the American Commission, "has been spending the money it has mainly in making a narrow, deep cut through the great divide that they have to get through to reach the other coast. The work is being well done. In regard to the Chagres River, we have found that the Panama people have a feasible way to manage that, although everybody laughed at them when they said they could dam it. We have a surveying party at this point now making the necessary survey on their plans."

INTERNATIONAL ARBITRATION AND ITS POSSIBILITIES

The two wars that within the present century have resulted in the greatest changes in the map of the world have been that between France and Germany in 1870 and that between the United States and Spain in 1898. The former not only transferred Alsace and Lorraine to Germany, but unified and consolidated the latter country, welding a number of kingdoms and grand duchies, with Prussia at their head, into the great empire of which the King of Prussia was made the first ruler. The war between the United States and Spain not only removed the Spanish flag from the western hemisphere and planted that of the United States over Cuba and Puerto Rico, but made the Great Republic of the West the ruler of the largest group of islands in the East Indies. In a recent interesting article in the London *Spectator*, these two wars are mentioned as among those which would almost certainly have been prevented by the operation of even that qualified and moderate system of international arbitration which was the principal feature of the work of the Peace Conference at the Hague.

HELPING NAVIGATION

In the interest of commerce the U. S. Coast and Geodetic Survey has now nine vessels charting the bottom, looking for isolated rocks on which ships may strike, studying the ocean currents, and gathering data for the Coast Pilot. Whatever facilitates approach to or departure from the coast increases the value of our products. The whole country benefits from easier communication by sea, and aids to navigation are therefore in the interest of public prosperity. The dangers to navigation form an important chapter in hydrographic work. On some parts of the coast submerged rocks are the constant dread of the mariner. Unknown channels are also a source of apprehension, while continual changes occurring in harbors are always dangerous. Thousands of miles of soundings are run every year, shoreline is drawn, light-houses and buoys located, and new maps are made or old ones brought up to date.

The localities in which work is now actually under way are Chesapeake Bay, Puerto Rico (where three vessels are employed), San Francisco, Seattle, and the Hawaiian Islands. Under the shadow of Haleakala, the largest extinct crater in the world, lies the beautiful harbor of Kahului. This is the outlet for much of the sugar from the rich plantations of Maui. The Coast and Geodetic Survey steamer *Pathfinder* is now adding to our maritime knowledge of this port by hydrographic surveys and otherwise. The coast charts of Hawaii, often unsatisfactory and always less accurate than the commercial importance of the place would justify and demand, will now be steadily perfected. It is hoped to continue surveying operations in these vessels until the principal parts are completely charted.

It may not be generally known that the work of the British Hydrographic Department is done by a civilian force under the direction of the Admiralty. In

many respects the organization is similar to that of the U. S. Coast and Geodetic Survey. The ships employed are not men-of-war, but regularly appointed surveying vessels. In 1899 four of these were employed at home and seven in foreign waters. Hydrographic work has been in progress in England for 110 years, and will, of course, be continued as long as English commerce exists.

RAILWAY CONSTRUCTION AND IMPROVEMENTS

While the construction of new lines of railway in 1899 was the largest since 1890, there are many evidences that it is to the improvement of existing lines rather than to the building of new ones that the railway managers of the country are giving their attention. The doubling of existing tracks, the straightening out of curves, the substitution of iron or steel bridges for wooden structures, an increase in rolling stock, in the capacity of cars, and in the hauling power of locomotives, together with the adoption of improved signaling apparatus, are reported from many different quarters.

Perhaps the most notable recent occurrence in the railway world is the completion of the Pennsylvania Company's four-track road over the Alleghanies. For several years past the construction of the third and fourth tracks has been gradually approaching the summit of the range on both the eastern and western slopes, and recently the very costly undertaking was completed, the final stage of the work including the famous Horseshoe Curve.

Another interesting occurrence is the filling in of Sheep's Canyon on the Burlington and Missouri River Railroad, eight miles north of Edgemont, S. Dak. The railway formerly crossed this canyon by a wooden trestle 700 feet long and 126 feet high. This bridge has now been done away with, an immense embankment having taken its place. The work of construction involved the employment of 1,486 trains of 15 cars each, 22,290 carloads of earth, or about 320,000 cubic yards, being required for the fill.

WHERE EXPLORATION IS NEEDED

A number of startling geographic statements which were circulated in the daily papers during March may be cited without comment:

E. S. Grogran, returning to London after a two years' journey overland from the Cape to Cairo, reports entering near Lake Tanganyika a region of active volcanoes, where he encountered "enormous lava streams forming a veritable sea 40 by 60 miles and 100 feet deep, forests and herds of elephants being buried in liquid fire."

"The neighboring country," he says, "is occupied by some 5,000 Balekas, ferocious cannibals from the Kongo, who live by man-hunting." His guides told him that the country, covering 3,500 square miles, had been until recently densely populated, but that the people had virtually been killed and eaten by

the Balekas. He says the Balekas are not repulsive to look upon. Although small, they are well-built and have good features. Men and women go about stark naked, and their long hair gives them a peculiarly wild appearance.

A burning cliff, rising from 20 to 2,000 feet directly from the sea and 20 miles long, the whole one mass of flames and smoke, is said to have been discovered by Mr A. J. Stone, of the American Museum of Natural History, in his explorations of the northernmost coast of America during 1899.

But most curious of all is the statement of a Mr La Joie, a French Canadian, who claims to have just returned from the North Pole, in the vicinity of which he had lived for nearly two years. In his hunting in Canada he traveled further and further northward until, after a series of marvelous adventures, he reached what he believes is the North Pole. Here he found a wild tribe of people, who speak a language different from any known and write in hieroglyphics. The climate was much milder than further southward. Finally Mr La Joie effected his escape from the tribe, and by continuous traveling on snowshoes succeeded in regaining the civilized world.

WORK IN THE ARCTIC AND ANTARCTIC

A Scottish expedition will undoubtedly be organized to coöperate with the English and German Antarctic expeditions of 1901. The Weddell sea quadrant, south of the Atlantic Ocean, will be the Scottish sphere. As previously noted in the NATIONAL GEOGRAPHIC MAGAZINE (vol. X, p. 316), the British sphere will be south of the Pacific Ocean and the German south of the Indian Ocean.

Lieutenant Robert E. Peary has probably by this time left his winter quarters at Cape Sabine, Ellesmere Land, and is well started on his dash for the North Pole. The series of caches of stores planted by him last year will lessen the difficulties of his advance to Cape Joseph Henry, where the real trouble will begin. Mr Peary planned to take about a dozen picked Eskimo and some 80 dogs and as many loaded sledges as the latter can drag. When a sledge has been emptied it will be sent back to Cape Sabine with one of the drivers, and the rest will push on. Thus he hopes to reach Cape Joseph Henry with a large supply of provisions. From this point he will then set out with only two companions.

The first South Polar expedition to winter on Antarctic land has successfully reached Wellington, New Zealand. Mr Borchgrevink, the leader of the party, reports that the south magnetic pole has been located, and that the expedition reached latitude 78° 50′, the farthest south ever attained by sledge. The expedition, which was fitted out by Sir George Newnes, of London, left Hobart, Tasmania, on December 19, 1898. During the latter part of February, 1899, the members landed from the *Southern Cross* near Cape Adare, Victoria Land, it having been arranged that the steamer should leave them there with a full equipment of every kind, and should return for them early in 1900. Mr Borchgrevink's party consisted of nine, including himself. Lieut. W. Colbeck, R. N. R., was selected as first magnetic observer, to be assisted by Mr Louis Barnacchi;

Mr N. Hansen and Mr Hugh Evans were chosen as zoölogists, and Dr H. Kloevstad as medical officer. With them went two natives of Finland to look after ninety dogs.

Another effort to discover some clue to the fate of Andrée will be made this summer. The Swedish-Russian Expedition, which will leave about June 1 for Spitzbergen to relieve the party that is at present engaged in the work of measuring an arc of the meridian in that latitude, plans to make a detour to King Charles Land and carefully search the entire neighborhood. It will be remembered that in September of last year a buoy was picked up on the north coast of King Charles Land, at 80° north latitude and 25° east longitude, marked "Andrée's Polar Expedition." When taken to Stockholm and opened, it proved to be what Andrée had called "the North Pole Buoy," and in which he was to place a message when he passed the North Pole. However, a microscopical examination of the interior could discover no message. As the buoy could not have drifted to King Charles Land from the neighborhood of the Pole, the only conclusion possible is that it was a part of the wreckage of the expedition, and that possibly more wreckage may be found near by.

GEOGRAPHIC LITERATURE

Contemporary History of the World. By Edwin A. Grosvenor, Professor of European History in Amherst College. Pp. ix + 173, with colored maps. New York: Thomas Y. Crowell & Co. 1899. $1.00.

In the production of this unpretentious duodecimo volume of less than 200 pages the accomplished Professor of European History at Amherst has placed the American people under an obligation that probably neither he nor they as yet adequately appreciate. Of all enlightened nations we have hitherto been the most self-centered. Engrossed in the development of the material resources of our own country, in the building of innumerable cities, the creation of vast industrial enterprises, the binding together of the several parts of our far extending domain by the greatest system of railways in the world—the equivalent of a ten-track road around the globe at the equator—and in the practical application of science to the affairs of everyday life to an extent unknown in any other country, we have had neither time nor inclination to give more than a passing thought to the affairs of other nations. We have been to a large extent ignorant of their political and social systems, notwithstanding our composite character as a people, and although an enterprising newspaper press has vividly pictured to us from time to time the great events that have been occurring on the world's stage, even the chief actors have soon been forgotten or have become to us mere names, less familiar in some cases than the more remote historic personages immortalized by Scott or Bulwer or Dumas, and possessing even less individuality than Adam Bede or Colonel Sellers or David Harum. How many graduates of our high schools, or even of some of our state universities, know anything about Stein or Cavour; how many could tell us who covered himself with glory by his heroic defense of Kars in 1855, or who was ground between

three Prussian armies at Sadowa; how many could give even an intelligent guess as to what kingdom was annexed to Prussia in 1866, or what city was the capital of Italy from 1864 to 1871? Such questions would probably be scorned, not only by that utilitarian visitor to the Yellowstone Park who, gazing upon one of the most interesting scenes in that wonderful region, remarked what a good place it would be "to scald hogs in," but by thousands of other men whose utilitarianism has not found so extreme an expression; and yet no one can be familiar with the great events that led up to the unification of Germany, can know how Italy came to be something more than a mere geographical expression, or have much acquaintance with the profoundly interesting series of events that have attended the gradual decadence and dismemberment of the Ottoman Empire in Europe without knowing all these and a thousand other things of which our average college graduate is entirely ignorant.

But whatever ignorance as to modern European history has existed among us in the past, its continuance in the future will be absolutely without excuse. Professor Grosvenor's new book, published at a price considerably below that of the average text-book, presents a narrative of the principal events of the last fifty years in Europe and North America that, while modestly disclaiming to be more than a mere outline, contains a wealth of interesting information, breathes the true historic spirit in every line and word, and is characterized throughout by a literary grace that constitutes it a veritable royal road to one of the most important departments of human knowledge.

The book opens with a brief but graphic recital of the stirring events that made the year 1848 one of the turning-points in human history, and then proceeds to discuss the influence of those events upon Europe. Chapter II deals with the Second French Republic, brought to so speedy a termination by the *Coup d'Etat*. A glance at Central Europe, the scene of a temporary triumph of reaction, and we are introduced to the Second French Empire, which, lasting less than 18 years, was yet signalized by three of the greatest wars in history, and came to its end in the midst of the most stupendous events the world had witnessed since the overthrow of the First Napoleon.

Succeeding chapters discuss the rivalry between Prussia and Austria, culminating in the Seven Weeks' War; the disintegrating influences at work in the new Empire of Austria-Hungary; the regeneration of Italy and those epoch-making events which preceded the transfer of the capital to Rome; the spread of Nihilism in Russia; the interminable Eastern Question in all its various phases; France under the Third Republic; the partition of Africa, Asia, and Oceania; the foreign and domestic policies of successive British ministries, with the final near approach of Great Britain to universal suffrage and equal rights, and, last of all, the marvelous changes the half-century has witnessed in our own country, which, almost against its will, has taken its seat in the parliament of nations and has made itself respected and recognized as it never was before.

Had Professor Grosvenor dealt with European history as a unit, his book would have been deprived of much of what constitutes its chief value, namely, its adaptation to the needs of the historical novitiate. He might, with that literary skill of which he is an acknowledged master, have presented us with a series of graphic pictures that would have challenged our admiration; but Euro-

pean history is too many-sided to be looked at from more than one point of view at a time, and a composite historical picture is more attractive than instructive. The author's primary purpose was to instruct, and he accomplishes that purpose best by successively changing his point of view from capital to capital.

It may seem hypercritical to pick flaws in so nearly perfect an historical mosaic, but one would scarcely think the student should have to look in vain for any reference to that most dramatic and portentous of all diplomatic incidents, the meeting of the King of Prussia and M. Benedetti at Ems, an interview that precipitated the war, and that subsequent disclosures have shown to have been brought about by the wily Bismarck for the express purpose of rendering war inevitable by exposing his sovereign to insult. The absence in the chapter devoted to the United States of any reference to the presidential campaign of 1896, with the important issues that it involved and the unprecedented cleavage of party alignment by which it was rendered memorable, is likewise noticeable. When even the United States Government itself has published a map showing the Oregon country as a part of the Louisiana purchase, it is scarcely to be wondered at that the publishers of the present volume have fallen into a like error. The Government, however, made haste to correct its mistake, and its example will doubtless be followed in the next edition of Professor Grosvenor's book.

History is the foundation of political geography, and no apology need be offered for reviewing at this length a book not strictly geographical. Professor Grosvenor's modest volume is a contribution of the first importance to both sciences. Its educational value is of the highest, and the book should have a large sale, not only among schools and colleges, but also for use in the family circle.

J. Hyde.

GEOGRAPHIC MISCELLANEA

The wheat acreage of the United States for 1899 is estimated by the Statistician of the Department of Agriculture to have been 44,592,516, yielding 547,303,846 bushels, with a value of $319,545,259. The corn acreage was 82,108,587, yielding 2,078,143,933 bushels, valued at $629,210,110; the acreage in oats, 26,341,380, yielding 796,177,713 bushels, valued at $198,167,975. The barley crop is estimated at 73,381,563 bushels, the rye crop at 23,961,741 bushels, the potato crop at 228,783,232 bushels, and the hay crop at 56,655,756 tons.

The opening up of Cuba to American methods in every department of life is being repeatedly emphasized. In this direction the census of the island for 1900, taken under the direction of the U. S. War Department, and the data for which are now being tabulated under the general supervision of Mr Henry Gannett, will prove immediate and effective. As an instance might be cited the establishment of corporate limits to Habana, Matanzas, and other cities on the island. Before the present year not a single town or city in Cuba had distinctive bounds.

Results of the surveys of Gila River, Arizona, have been published as *Water Supply and Irrigation Paper, No. 33*, of the United States Geological Survey. The bulletin gives a description of southern Arizona, with views illustrating the character of the country, and maps and diagrams showing the location of the sources of water supply and the possibilities of storing water for the development of agriculture. It is shown that the construction of storage works on Gila River at a cost of about one million dollars would many times compensate for the outlay, through the sale of public lands and the increase of taxable property.

The second school of forestry to be founded in the United States will soon be established at Yale University, Mr and Mrs James W. Pinchot, of New York, and their sons, Gifford and Amos R. E., having generously endowed that institution with $150,000 for the purpose. Mr Gifford Pinchot is the forester of the U. S. Department of Agriculture, and his services to this cause are well known to the public. In addition to the gift of the large sum named, use is given to the University for a term of years of a large tract of forest land in Pike county, Pa., where the practical workings of economic forestry may be demonstrated—as well as the use of buildings in this locality serve as a local headquarters for the school. Mr Henry S. Graves will be the director of the school.

Under the law no one can do any dredging on the water front of Cape Nome within a three-mile limit without the authority of the War Department. That authority has now been granted in several instances because it was shown that the proposed dredging of sand would not interfere with navigation or the rights of owners of adjacent territory. The particular character of the sand to be dredged did not enter into the consideration of the case. The Secretary of War states that any one is privileged to dig for gold in the open sea, and the only question considered by the War Department is whether such operations conducted within the three-mile limit are an interference with navigation or an infringement on the rights of others. When these conditions are complied with the Department is prepared to grant permission to any one to dig in the beach at Cape Nome or at any point lying within three miles of low-water mark.

The bubonic plague has increased in severity and extent during the past month. A dispatch from Cape Town to the London *Times* announced the discovery of a case in that port early in March. The infected vessel was an army transport from Rosario, Argentine, where the epidemic had prevailed for several months and where the quarantine had only recently been raised. In San Francisco several cases, supposed to be genuine, were discovered in Chinatown, but energetic measures have prevented contagion. Advices have also been received by the Surgeon-General of the Marine Hospital Service of the presence of the plague in the Island of Cozumel, off the east coast of Yucatan, Mexico. It had probably been brought here directly from Brazil. In Honolulu its severity seems to have passed, though a large number of sporadic cases are still arising. From Manila the disease has spread to Iloilo and also to Hilo. It has, however, been considerably retarded in its occupation of the Philippines. In India the frightful ravages have continued on the increase, with no prospect of immediate abatement. A recent telegram from Calcutta states that 4,725 deaths occurred in that city and in Bengal in a single week.

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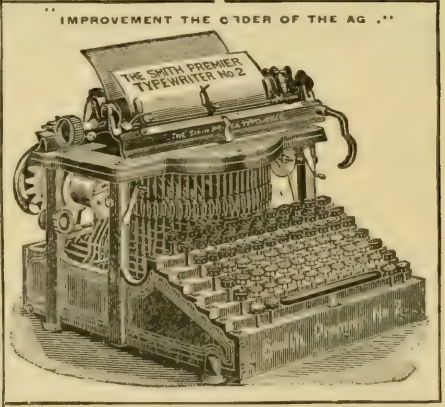

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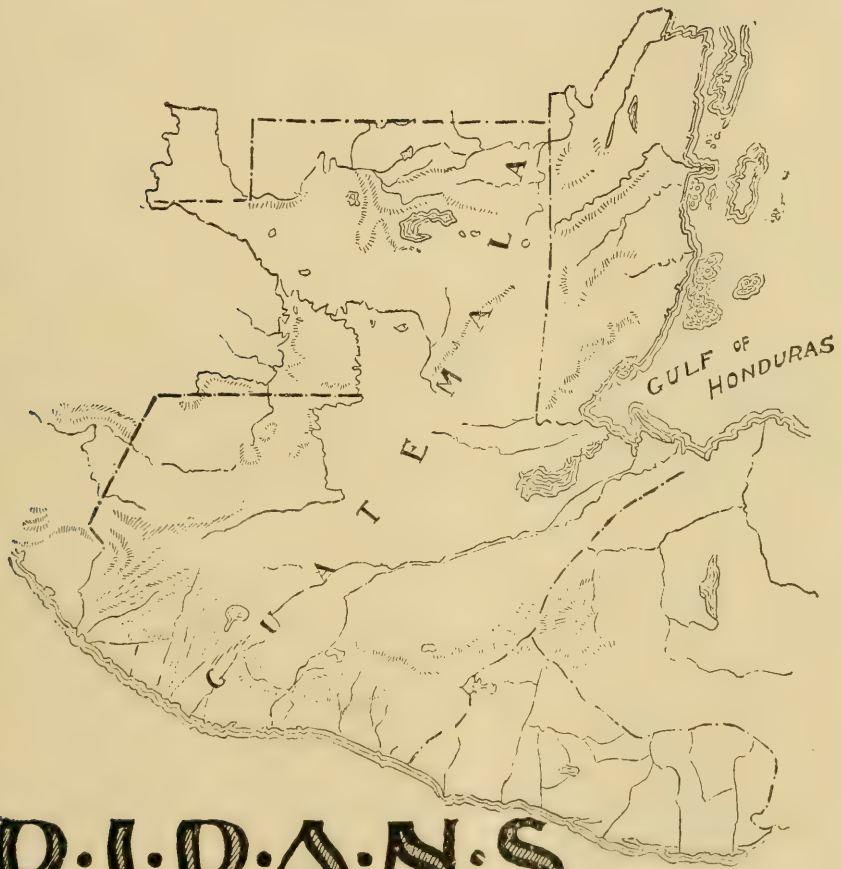

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THE ANNUAL FIELD MEETING

of the NATIONAL GEOGRAPHIC SOCIETY has been arranged so that the members of the Society may have an opportunity to observe the total eclipse of the sun which takes place on Monday, May 28. As the center of the belt of totality will pass near Norfolk, Virginia, the board of managers of the Society have made a conditional contract with the Norfolk & Washington Steamboat Company for an excursion to that city and vicinity. The party will leave Washington by the Norfolk & Washington steamer at 7 o'clock P. M., Sunday, May 27. Returning, leave Norfolk at 6 o'clock Monday afternoon, reaching Washington on Tuesday morning in time for breakfast at home.

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The following articles will appear in the Magazine within the next few months:

"The Road to Bolivia," by Hon. Wm. E. Curtis.

"The Growth of Germany," by Professor J. L. Ewell of Howard University.

"The Annexation of the West," by F. H. Newell, Hydrographer, U. S. Geological Survey.

"The Growth of England," by Dr Edwin D. Mead, Editor of the *New England Magazine*.

"The Colonial Expansion of France," by Professor Jean C. Bracq of Vassar College, Poughkeepsie, New York.

"The Native Tribes of Patagonia," by Mr J. B. Hatcher of the Carnegie Museum, Pittsburg, Pennsylvania.

"Explorations on the Yangtse-Kiang, China," by Mr Wm. Barclay Parsons, C. E., surveyor of the railway route through the Yangtse-Kiang Valley.

Entered at the Post-office in Washington, D. C., as Second-class Mail Matter.

STREET SCENE IN JOHANNESBURG

THE

NATIONAL GEOGRAPHIC MAGAZINE

VOL. XI MAY, 1900 No. 5

THE GROWTH OF RUSSIA

By EDWIN A. GROSVENOR,

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Russia in history and character is the product of geographic environment. Nowhere, not even in Greece or Spain, have physical causes been more powerful in determining the political and religious ideas of a people and in shaping that people's destiny. Slow working through the space of over a thousand years, those causes have evolved the Russian as he is and created the Russian Empire as we behold it today.

Of all European countries Russia is the farthest away. It is separate from us not only by leagues of territorial distance, but by the more repellent distance of language and race. The theory of government which it has developed is the direct opposite of our own. The Christianity to which it clings with unsurpassed devotion is neither Protestant nor Catholic. Its Eastern orthodoxy is a wall of separation from rather than a bond of union to the West. Russia stands in immense isolation apart from all the rest of the European continent, and yet its most commanding and stateliest figure.

PHYSICAL CHARACTERISTICS

Physical geography by an irregular north and south line divides Europe into two nearly equal but most dissimilar portions. In the western portion is seen every possible diversity of outline and surface. Enormous peninsulas thrust out from it into the sea and enormous gulfs and bays project themselves into the land. The limitless variety of the mountains, rivers, islands, and plains is mirrored in the limitless variety of the human groups which dwell upon them.

To all this eastern Europe presents a marvelous contrast. Whatever western Europe is, that eastern Europe is not. A prodigious plain, more than two thousand miles in length and almost a thousand miles in breadth, stretches southward from the flat shores of the Arctic Ocean. Hemming it in as boundaries and marking its extent are, on the northwest, the Valdai Hills and the granite cliffs of Finland; on the southwest, the Carpathians; on the south, the lofty spurs of the Crimea and of the Caucasus; on the east, the Ural Mountains. Thus outlined in immensity between its mountain limits is an area of almost two million square miles. This area is uniform and monotonous. Except at the extreme west, south, and east, nowhere does the surface of the ground attain an elevation of 1,000 feet. Not a single range of lofty hills, not a single lonely peak breaks the universal sameness. The rivers, tortuous and creeping, seem doubtful in which direction to find their channels. The Volga through its 2,400 miles of wandering has an average fall of only four inches to the mile. The geologic strata are horizontal. Rarely does a boulder or rock emerge above the surface of the ground. Even the winds are seldom fitful. Either they blow with icy coldness in unhindered sweep from the Arctic Ocean or come with the hot breath of the sands from the south and the deserts of Turkestan.

Degrees of latitude do not affect the essential territorial unity; neither do the four so-called agricultural zones which, rudely parallel to each other, occupy the entire area. By far the vastest is the forest zone or forest region, with an extent of 1,400,000 square miles. League after league, it stretches northward—somber, awful, infinite—broken here and there by wide, open tracts, and yet seemingly continuous until it ends amid polar marshes which never thaw. It is bounded on the south by the zone of black earth. Without artificial stimulant, there the exhaustless soil yields harvests as abundant as in the days when half of Europe was dependent upon it for food. It covers an area equal to the combined territory of Ohio, Indiana, Illinois, Michigan, and Wisconsin, and is prolonged beyond the Ural and Caucasus into western Asia. Next comes the region of the steppe, where a forest or a tree is rare, but where the tall grass and reeds shoot up often seven or eight feet high. All of this territory is capable of cultivation. It equals in extent Kentucky, Tennessee, Missouri, Arkansas, and Mississippi combined. Last of all are the indescribable, shapeless tracts along the southern mouths of the rivers. These form the so-called barren steppe, which no industry or art of

man can reclaim. Though resembling in no other respect those splendid States of the American Union—Georgia, Alabama, and Florida—it almost exactly coincides with them in area. The general aspect of this steppe is Asiatic rather than European.

No natural divisions anywhere intersect these zones to allow the erection of jarring local interests into separate states. The difference between them is in agricultural capability. They bear no other landmarks than the funeral mounds of a bygone age, which, laboriously constructed, dot their face. Over illimitable forest and illimitable steppe hovers a uniformity as limitless as the limitless variety of western Europe. In the upheaval and turmoil which preceded and followed the fall of the Roman empire, barbarian hosts of various lineage chased each other all over that prodigious plain which we call Russia today. Its predominant physical features were then the same as now. But upon the tumultuous, receding masses of humanity they produced impressions no more permanent than did the clouds. In time the tribal movements diminished and almost ceased. Most of the tribes that outlived disease and carnage settled in fixed habitations. The boundaries of their nascent states were vague and shifting, but they now possessed a recognized center from which to act and around which to grow.

THE SLAVS, THE FINNS, AND THE TARTARS

Thus in the western portion of the plain a large body of Slavs established their definite home. Of Indo-European or Aryan stock, they were the distant kinsmen of the Teutons, the Celts, and Greco-Latins, who had parceled out among themselves the central, western, and southern portions of Europe. By far the larger part of the plain remained under the control of various Turanian or Tartar-Mongolian tribes. They may be included under the general names of Tartars and Finns. The Finns held all the sparsely inhabited country between the Baltic Sea, the Arctic Ocean, and the Urals. South of them, as far as the shores of the Black Sea, were found mixed tribes of Finns and Tartars. Northwest and north of the Caspian Sea were Tartars and Turks. Finns and Tartars were descended from a common original stock and were kindred to the ancestors of the Magyars or Hungarians and of the Ottoman Turks. The word Russian or Russia was then unknown. But all the history since of an empire—expanding like the tree of Holy Writ, which overspread the earth—

is but the later history of those Slavic bands, planted in the plain and confronted throughout its larger part by the children of the East.

THE BEGINNINGS OF NATIONAL EXISTENCE

History has no drearier, more depressing page than that wherein is written the story of Russia from the tenth to the fifteenth century. Disastrous as were the intermittent foreign wars, still more destructive was the internecine strife in which cities and districts and principalities constantly engaged.

None the less we who look back to those times along the unrolled panorama of a thousand years can trace the energizing, mighty forces which even then were shaping the Slavic nature and the Slavic Empire like plastic clay. A nation is never born except in anguish. The pioneer period of national existence may always be traced, like the march of Washington's army through the snows of New Jersey, by the stains left from bleeding feet. Amidst dissension and fratricidal strife the sense of possible national life was quickening and the goal of national existence was being slowly approached. It was much that the strength of the Finns had been broken; that more than one attack from Lithuanians had been repressed; that on the banks of the Neva Alexander Nevski had won over the Swedes a decisive victory, which the Russian church commemorates with hymns and thanksgiving annually to this day.

Of momentous consequence was the fact that their newly embraced Christianity had come from Constantinople and not from Rome. The other leaders of the Slavic race, the Bohemians and the Poles, had been converted by apostles whose spiritual head was the Pontiff upon the Tiber. The Russian church had found its father in the Patriarch upon the Bosphorus, and its brethren in the adherents of the Eastern Orthodox faith. In coming years, when religion and politics were to be strangely blended, Russia, because of that early and unbroken bond, would be of necessity the sympathetic champion of her coreligionists throughout the East.

But it was most of all under the blows of the Mongol invasions that Russia found her need of union and was hammered into shape. Against the resistless might of overwhelming numbers, the courage and desperate resistance of the Slavs were of no avail. During two hundred and thirty-seven years Mongol conquerors racked the land with their merciless rule. One-half of the country was occupied by their hordes. A portion of the other half was left to the inhabitants, who paid heavy tribute and who, princes and people, acknowledged themselves the humble vassals of the Khan. Poland, favored by the Mongol conquerors, seized the southwestern portion of the plain. Thus Poland was enabled to span Europe from the Baltic to the Black Sea; but her gains were destined to bear bitter fruit. Born from it was that traditional Russian hatred for Poland and all things Polish which future wars were to perpetuate, but could not intensify.

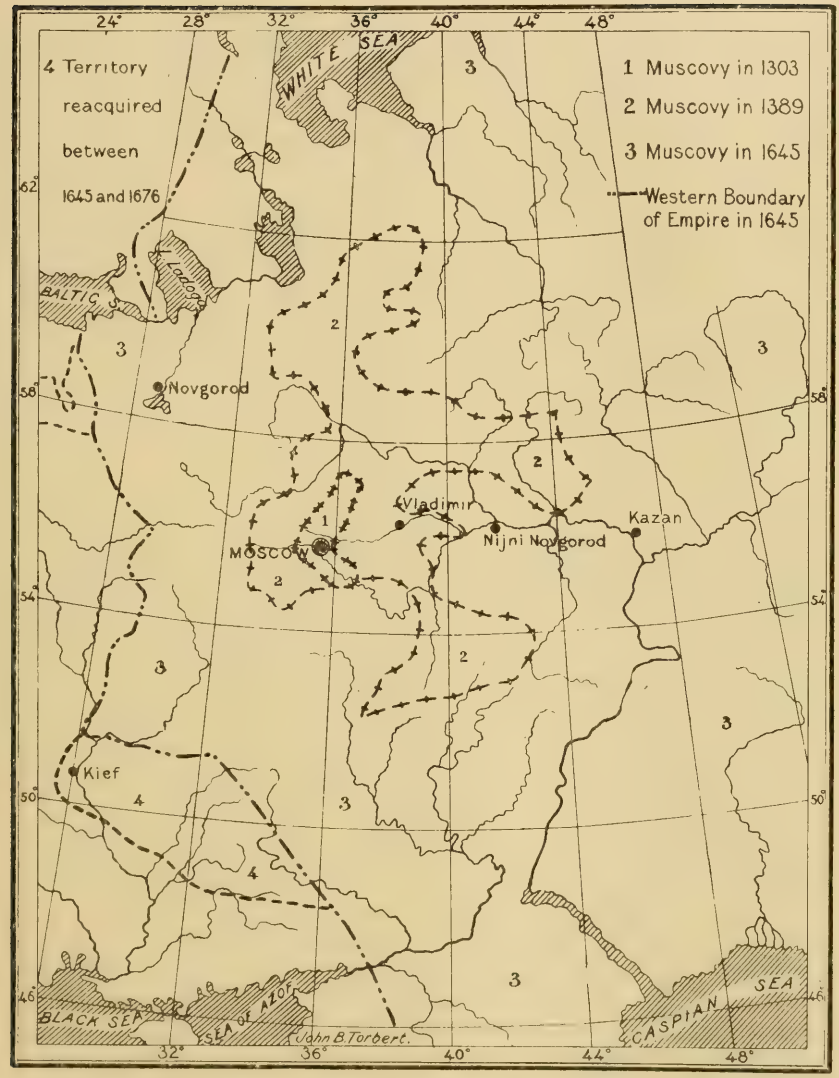
Yet, crushed and mangled, the nation was taking definite form. In the twelfth century a prince, pursuing a defeated rival, had halted

on a pretty elevation which overlooked the River Moskva. The spot pleased his eye. He built there a church and village. Both long remained in almost forgotten obscurity. But the later chroniclers embellish that foundation with as many romantic legends as the Roman writers throw around the building of Rome. The church has since become the Kremlin, unequaled and gorgeous combination of monastery, cathedral, palace, fortress, and imperial mausoleum. The village, taking its name from the river, grew into the metropolis and capital which the Russian peasants with mingled veneration and truth call the "Holy Mother Moscow."

It would be a congenial task to trace how waves of resistance to the Mongols, of conquest over hostile and rival towns, and of widening political influence radiated from this center. It was shown, as M. Rambaud eloquently says, that "the Slavic soul had been confined, not depraved or enslaved, by the Tartar terror, and was only biding its time." Shrewdness, suppleness, and heroism were reasonably combined in the princes of Moscow. Dimitri of Moscow, by a victory over the Mongols upon the Don, proved that the dreaded foreign oppressors were not invincible. Though the Mongol yoke was shortly riveted again, none the less the eyes of the people grew accustomed to looking upon Moscow as their future deliverer. At last it was from Moscow that their deliverance proceeded. On the lips of foreigners Muscovy and Muscovite became the term to denote the entire country and its inhabitants. Even today an Ottoman Turk always speaks of a Russian as a Moscov.

Meanwhile Constantinople and the Byzantine Empire had fallen before the mace of Sultan Mohammed II, the conqueror. The heiress to the shattered empire was the Princess Sophia. When, in 1472, she wedded Ivan III, Grand Duke of Moscow, she brought to him as her imperial dowry her claim to the Byzantine throne. Her husband assumed the title of Czar and adopted as his coat of arms the double-headed eagle of Constantinople. Wherever the Russian escutcheon is now displayed, enwrapped in the ermine and surmounted by the jeweled crown, it is a reminder not only of that historic marriage, but of the definite hope and aspiration of the czars.

In 1598 the Czar Feodor died, and with him the royal house of Russia became extinct. The heir to the throne, the boy Dimitri, had five years before preceded him to the tomb. A crowd of impostors arose, each claiming to be the dead prince. Each pretender drew after him a host of armed partisans, and Russia was given over



GROWTH OF RUSSIA IN EUROPE FROM 1303 TO 1645

to anarchy and civil war. The Swedes invaded the country from the north; the Poles seized the south, captured Moscow, and placed a garrison in the Kremlin. The state, so many years in painful building, seemed already become the permanent spoil of its hered-

itary foes. Then with one spontaneous outburst Russian nationality awoke to life. Priest, noble, tradesman, peasant rose as a single man. From every direction in impetuous companies they pressed toward Moscow. The leaders of the movement were the butcher Minine and the Prince Pojarski. They swept the foreign garrisons and the foreign armies from their path like chaff. The Russian people had rescued Russia.

Then from all over the country delegates were chosen to meet in solemn conclave at Moscow and elect a czar. In no part of Europe had a great popular assembly, equally representative of all interests and classes, ever met to select a nation's ruler. The contentions were long and fierce. At last the delegates agreed in the unanimous choice of Michael Romanoff. No other dynasty reigning in Europe today owes its original existence to the choice of the people in equal degree with the Russian imperial house.

PETER THE GREAT

It is not my purpose to narrate Russian history except wherein that history is synonymous with growth. I wish to contemplate that word growth in its largest and most comprehensive sense, including thereby creation and development of national character no less than increase of national territory. In fact, the former is the more important, is the essential element of the two. The concentric accretions in expanse of area under the Grand Dukes of Moscow and the czars were but the consequence of that character, painfully elaborated by geographic environment and time.

Peter, whom the world rightly honors as the Great, came to the throne in 1689. Thus far the Russian Slavs had fought and suffered and grown strong in almost Oriental seclusion. It was Peter who first compelled them to learn the crafts, study the institutions, and benefit by the manners and appliances of the West. The diplomacy begun by Ivan the Terrible he carried farther, and forced Russia into unwelcome and unwelcomed fellowship with the European states. His ambitions and achievements are too familiar to repeat. His paramount interest to us consists in this, that he was, more than any other Russian ruler had ever been, the incarnate spirit of his people. He, indeed, stood on a higher plane and looked out with a larger vision than had any other Slav before him. Yet in the bedrock of his character he was preëminently a Slav. His two chief natural endowments were a patience that never failed and a persistence that knew no de-

feat. No other people have possessed or now possess these qualities equally with the Russian Slav. Herein was the difference between Peter and Charles XII of Sweden. Charles XII was only an episode in a drama. Peter was a colossus that could not be shaken and remained. Before he was born the Russian people had been fashioned into an efficient weapon ready to his hand. The dormant spirit of a mighty nation had revealed itself in him. On the decisive field of Pultowa, Sweden received a blow from which she has never recovered. St Petersburg, built among the marshes and the forests of the Neva, is the majestic monument of that victory and of his reign. To it the discouraged but venerated Moscow yielded its proud rank as capital. With its erection Russia consecrated the spot where her foot first touched the shores of a western sea.

TERRITORIAL EXPANSION SINCE 1725

The territorial expansion from the death of the Great Czar until the present year can be shown more clearly by the map than by any description in words. The whole added territory on the west and south constitutes a sort of territorial fringe, with an average width of over 200 miles. It extends from the Arctic to the Black Sea, and thence strikes southeastward till it reaches the Caspian.

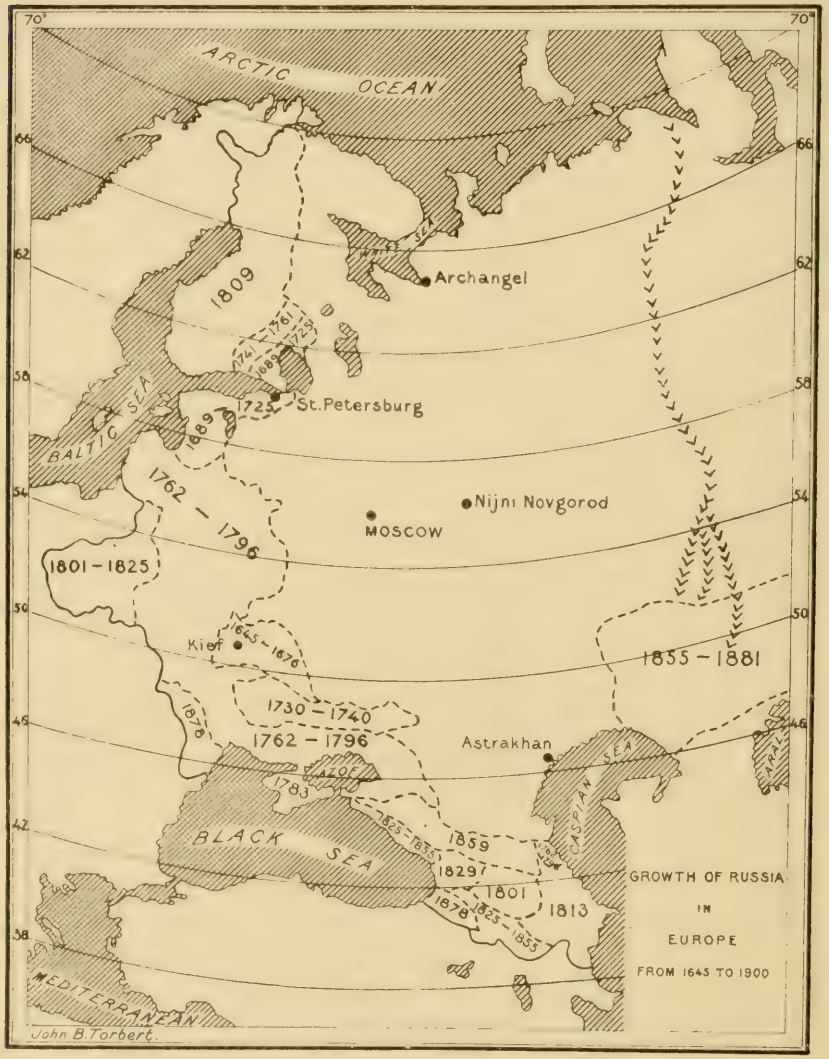
In her extension east Russia pressed on toward the Pacific Ocean, completing the acquisition of Siberia. Whatever claims China possessed to the left bank of the Amur and the right bank of the Usuri were peacefully ceded by her to Russia in 1860. Port Arthur, on the Gulf of Petchili and Talien Wan, were just as peacefully ceded by the same power in 1897 for a nominal term of twenty-five years.

Such territorial extension not only amazes but appals. It does not so impress by its vastness as by its continuance. Ever since Russia, according to the Slavic saying, "found herself," this process has been going on. Were it in consequence of a temporary popular spasm, or of the exceptional tendency of a single reign, the considerations it opens up would be less momentous.

A COMPARISON OF THE ACQUISITIONS OF TERRITORY BY GREAT BRITAIN AND RUSSIA

It is true that the acquisitions of territory by Great Britain during the last century have been on an even more stupendous scale. Since 1870 Great Britain has annexed to her empire 2,854,170 square miles of territory and 125,000,000 human beings. Yet, though Great Britain

in less than a generation has added to herself an area larger by 800,000 square miles than Russia in Europe, and a population almost as great as that of the entire Russian empire, her annexations do not equally disturb the political equilibrium of the world. Though politically connected with her and dependent upon her, they do not feel themselves an integral part of her. The East Indian, the Cypriote, the



Egyptian never can be a Briton or an Englishman. Except so far as the inhabitants of annexed territory are natives of Britain or descendants of British stock, they increase her danger rather than contribute to her strength. The French of Canada, who have been subject to the British scepter one hundred and forty years, may be cited as an exception to this statement. Though carrying law and order with him, the Englishman does not possess and almost despises the faculty of assimilating a conquered people and identifying them with himself. From them he dare recruit but a small number for his armies, and only with the most solicitous precaution. That small number he must keep in positions of safe inferiority.

Russia, unlike Great Britain, makes no acquisitions which do not border on her own soil. Only such territory as is adjacent or will speedily become adjacent does she annex. To the United States she willingly disposes of Alaska, which the accident of discovery had placed under her flag. To Japan she cedes the Kurile Islands for land nearer home. But territory once hers is completely incorporated in her empire for weal or woe. Once within the iron grip of her iron hand, there is no escape for Tartar or Cossack or Kalmuck or Pole or Finn from ultimate identification with the Russian. From the conquered she forms battalions and regiments and brigades, and stimulates their fidelity and fires their ambition with important commands. Whole army corps she entrusts in time of war to the Armenians Melikoff and Der Hougassoff and to Alikhanoff, the Turkoman. Beneath her sway there is a uniformity of service and subjection like the uniformity of the plain that has reflected itself in Russian nature. For years the acquiescence may be forced, but one generation passes away and another comes that is profoundly Russian except in remote ancestry.

Moreover, there is a marvelous assimilating faculty in the Slav. The Greco-Latin never possessed it, nor does the Celt or the Teuton now. In preëminent degree is the Slav endowed with the genius of emigration and colonization. There is a rough picture, frequently seen, of the Russian emigrant. His axe fastened to his belt, his boots with prudent economy hanging from his shoulders by a cord, his fingers bent in the sign of the cross, his face looking straight before him, he stolidly steps on to the beyond. Herein is the significance of each Russian annexation. It augments the strength which has produced it.

There is another essential difference to be noted in the relations of

Russia's dependencies and those of Great Britain with other nations. I mention Great Britain because out of all the powers of the eastern hemisphere she alone in magnitude and strength can be weighed in the same scale with Russia. Russia's gains touch the borders or affect the direct interests of few European states. She may arouse their jealousy or fear, because she casts so stupendous a shadow upon the world-map, but she seldom comes into perplexing or irritating connection with them. She is not near at hand to excite their suspicion, endanger their welfare, or humiliate their pride. Wherever there is a British possession it must impinge upon or wound the susceptibilities of somebody else. Hence arises an infinity of possible complications and troubles which only long-suffering tact and sorely strained compromise can adjust. But Russia's fingers touch neither North nor South America, Africa nor Oceanica—that is, throughout one of the hemispheres and by far the largest portion of the other nowhere does her tread threaten to trample on another's feet.

RUSSIA'S INACCESSIBILITY BY SEA

In nothing is the contrast greater between eastern and western Europe than in their accessibility by sea. Russian territory comprises about eleven-twentieths of Europe, and the non-Russian territory, shared by nineteen states, the remaining nine-twentieths. The nine-twentieths have a coast line of over 15,000 miles. The eleven-twentieths have a coast line of less than 5,000 miles, 2,400 miles of which extend along the inhospitable and frozen shores of the Arctic Ocean and White Sea. The remaining 2,600 miles nowhere touch the ocean or any of its immediate waters. They border only on three inland, almost land-locked seas—the Baltic, the Black Sea, and the Caspian. The White Sea and the Arctic Ocean are navigable only from June to September, about four months each year. The eastern Baltic is commonly shut to navigation from the end of November to April. The Caspian is an Asiatic lake, connecting with no other water. The Black Sea is shut in by European diplomacy to the navies of Russia. Not a fishing smack can descend the Bosphorus without the special permit of the government of the Sultan.

The rest of the European world looks out upon—accessible at its door—the chief maritime highways of mankind, the North Sea, the Atlantic Ocean, and the Mediterranean. Russia, with her swelling population, her tremendous area, and her enormous products, does not touch upon those highways at any point. What the Mississippi

basin was to the adventurous pioneers beyond the Alleghanies, what it now is to all the opulence and enterprise of the imperial center of our nation, that nature designed from all eternity the current of the Bosphorus should be to the inhabitants of that northern plain. For that natural outlet the Russian nation waits with the assurance of the patient and strong.

THE INFLUENCE OF RUSSIA AS THE HEAD OF THE ORTHODOX CHURCH

The foreigner can hardly appreciate the peculiar influence accruing to Russia in Eastern Europe from the relations which she sustains as the political head of the eastern Orthodox Church. During the "Age of Woe" she was herself the victim of Mussulman Mongols. What she suffered then is still handed down by countless traditions and is burned into the national memory. Western Europe, even in Spain, has never experienced such horror and terror at the hands of Islam. Hated as oppressors, the Mongols were abhorred as infidels. When at last the Russian broke his chains his thanksgiving was for a double victory. Orthodox Christianity had triumphed over Islam and the natives of the soil had triumphed over the invader. Russia stood forth as the victorious champion of her faith. Under the Ottoman Turk, in a later and less barbarous age, she saw repeated among her coreligionists something of that treatment she had herself experienced at Mussulman hands. In the East the tie of a common faith is strong. To her, as to no other human power, the subject Christians of the Balkan Peninsula generation after generation ever stretched their supplicating hands.

On the part of the Russian people rather than of the Russian government there was always present for the members of their common church an intense sympathy, of which state policy might take advantage, but which it could not wholly check or restrain. The Russian peasant calls a war with the Moslem "God's battle." In 1877 the sympathies of the common people for Bulgaria forced the government into a war, of which neither the Czar Alexander II nor his chancellor, Gortchakoff, approved. There is a burying place in Constantinople where more than three hundred Russian soldiers rest in a common grave. Taken prisoners, they died in captivity during the war of 1828–'29, which Russia waged for the freedom of Greece. The epitaph on the white marble describes the manner of their death and closes with the verse, "Greater love hath no man than this, that he lay down his life for his friends." To Russia Roumania, Servia,

Montenegro, and Bulgaria owe their quasi-independence. How far selfish motives have controlled her action they can not tell, but of one thing they are sure—it is, that Russia has fought for them, and that no other European nation ever expended anything but words in their behalf. Despite intrigues from abroad and petty ambitions and jealousies at home, the coöperation of the Balkan States is assured to Russia.

RUSSIA'S INFLUENCE IN ASIA

Russia's larger and more recent conquests have been in Asia. Confronted for centuries by Orientals, both along her borders and upon her soil, she understands the Oriental to the core. Among these wild and lawless peoples, explosive as gunpowder, the torch of civilization can be carried only with a firm and steady hand. Asia has never voted except with swords. The sword is the only ballot which the continental Asiatic respects or comprehends. In that vast region, wherever her rule has gone, it has been equally vigorous and beneficent. From the Bosphorus to China there is an awe of Russia such as no other power on earth can inspire.

THE DESTINY OF RUSSIA

But it is not in broadening territorial extent or teeming numbers, not in world-wide prestige or disciplined armies, that a nation must confide. The throne of Napoleon III was falling months before he declared war against Prussia and set out on his journey to Sedan. The foundation stone of national existence and national greatness is the spirit of a people.

In the peculiar character of her common people is Russia's abiding strength. Tenacious, docile, imitative, but not inventive; receptive, but not constructive; profoundly religious, as he understands religion: submissive to what he considers the will of God and the Czar, the Russian has remained unchanged through all these changing years. Said Grodzitski in the tower of Kudak when surrounded by his foes: "I am commanded to stay here, I stay; commanded to watch, I watch: commanded to be defiant, I am defiant; and if it comes to dying, since my mother gave me birth, I shall know how to die, too."

There were only 12,000,000 Russians when Peter, at the beginning of the last century, crushed the might of Sweden at Pultowa. There were only 28,000,000 when Catharine II signed the first treaty be-

DIAGRAM SHOWING SUCCESSIVE ADVANCES OF RUSSIA TOWARD INDIA

tween Russia and the United States. There were only 45,000,000 when, during the reign of Alexander I, Napoleon the Great began his march to Moscow. There were 68,000,000 when, during the Crimean war, Nicholas I withstood the combined strength of Sardinia, Turkey, Great Britain, and France. There are 130,000,000 today. According to the natural law of increase, there will be 250,000,000 during the lifetime of many who read these words. Doubtless before that not-far-distant period arrives the map of the world will show many changes. States now existing will disappear and new states may be born and write their names upon the chart. In Russia, indissoluble on her plain and virile in her strength, there is no symptom of decay. While thrones topple and old names vanish, Russia remains. The perpetuity of the American Republic is not more sure.

Russia has been preparing for a thousand years and is still preparing for her destiny. The present in all its magnificence of endeavor

and achievement is but the guarantee of a far grander future. It would be a congenial task to linger upon great national enterprises begun and fast pushing to completion. Above the quicksands of Turkestan and through the wastes of Siberia to the Eastern Ocean Russia is constructing her solid iron roads. Over the face of her prodigious European plain she is marking out the paths of the canals on which from sea to sea navies will ride. Siberia, the old-time synonym of desolation and solitude, is inviting the activity of the colonist, whether farmer, miner, or engineer. Korea and the provinces of dormant or disintegrating China await their share in the world's life from the electric impulse of her northern brain. That brain is to nerve Asia, long outworn, to a resurrection as from the dead. What the warrior monk Elias uttered long ago receives confirmation every passing year: "The progress of Russia is mysterious and profound. Before she moves she neither betrays her plan nor hesitates nor boasts, but none can hinder her arriving where she has set her will."

Not long ago I received a letter from a Bulgarian friend, a leading member of the Sobranie, or Bulgarian Chamber of Deputies. He uses these words: "In the near or distant future I see only two prominent nations—the United States in the west, and Russia owning nearly the whole of Asia and exercising a preponderant influence over the European continent. The whole of the Balkan peninsula, Asia Minor, Persia, Central Asia are her natural and inevitable inheritance. Above Asia and Europe I see the White Czar of Holy Russia. Your people need have no concern. The interests of Russia and the United States nowhere conflict. Naturally they are friends and allies. Together they are to regenerate the world." Thus the Bulgarian statesman utters his own conviction and the great political credo of the Slav.

The one necessity and the chief ally of Russia is time. How far the peace manifesto of Nicholas II was prompted by philanthropy or by profound but selfish statecraft it is impossible to know. If philanthropy, that manifesto remains the noblest and most memorable document ever issued by a Christian monarch; if political sagacity, that manifesto is in appreciation of the future the astutest utterance ever made by the occupant of a Russian throne. But it is unbecoming to question the hidden motives of a deed in itself sublime. History will record no more than this: that at the close of a century more crowded with bloodshed and war than any other since time began, Russia through the voice of her autocratic Czar put forth a plea to all mankind in favor of universal brotherhood and peace.

THE RUSSIAN EMPIRE IN ITS GEOGRAPHICAL RELATION TO EUROPE AND ASIA

INFLUENCE OF GEOGRAPHICAL CONDITIONS ON MILITARY OPERATIONS IN SOUTH AFRICA

By Major W. A. Simpson, U. S. A.,

Assistant Adjutant General and Chief of the Military Information Division, U. S. War Department

In all military operations the character of the terrain exercises a very important influence. All great generals have understood and utilized this fact. A knowledge of the geographic character of the country is necessary to an understanding of a campaign.

The principal watershed of South Africa is the Drakensberg Range. It extends generally in a northeasterly and southwesterly direction, nearly parallel to the coast line of the Indian Ocean, and at an average distance from it of about 200 miles. Along the Indian Ocean there is a belt of low land. Going inland the ground rises in a series of irregular terraces, until the highest altitude is reached in the crest of the Drakensberg, some of whose peaks are over 10,000 feet high. The western slopes of the Drakensberg are much more gentle than those on the eastern side, and the ground falls away gradually into the great central plateau, of which the South African Republic and the Orange Free State form the principal part. In this respect the Drakensberg Range is comparable to our Rocky Mountains, the ground rising gradually going west from the Mississippi Valley, and descending more abruptly from the crest to the west. In the southern part of the South African Republic runs, east and west, the Witwatersrand, or the Rand, as it is commonly called. This forms a secondary watershed. The rivers to the north flow into the Limpopo, which is the northern boundary of the South African Republic, while those to the south flow into the Vaal.

Although it has been stated that the ground rises from the Indian Ocean in a series of terraces, it is not intended to convey the idea that these terraces are level. The term terrace is used simply to convey the idea of a belt of nearly uniform *average* elevation. As a matter of fact, the country in Natal (this does not embrace all the territory east of the mountains, but it is all that it is necessary for us to consider) is very much broken. There are many streams which, rising

in the Drakensberg, flow toward the Indian Ocean. As they fall thousands of feet in a comparatively short horizontal distance, they are naturally characterized by many waterfalls and rapids. The country is seamed with ravines, which grow narrower and whose sides become steeper as the mountains are approached. There are many hills, some nearly circular in shape, others in the form of ridges, whose sides are generally steep and strewn with boulders.

In the central plateau, which is lowest near its western border, the country generally appears level, but hills rise abruptly from the plain, with sides in many cases so steep and rough that it is difficult to get guns up even when the hills are undefended.

The rivers, after heavy rains, become swollen, and in the dry season have but little water, and at times none at all. They generally run through gullies considerably below the level of the banks, and this makes them difficult to cross. They are useless for purposes of navigation and merely serve as obstacles.

The rain winds come principally from the Indian Ocean, and as the Drakensberg cuts off the moisture, it is much drier west of that range than east of it. The average yearly rainfall at Durban is over 39 inches, while at Bloemfontein it is only about 21. The rainy season is in the summer, which corresponds in time to our winter.

The South African Republic and the Orange Free State are very sparsely settled, and the principal occupation is cattle-raising. In the rainy season grazing is good on the veldt. In the dry season the grass dries up and the cattlemen have to move their stock from place to place in search of water. The country is generally somewhat barren, and, except in the southeastern part of the Orange Free State, in the country around Wepener, not much attention is given to agriculture.

THE NECESSITY OF RAILWAYS

South Africa is largely dependent upon railroads for transportation. All countries are, of course; but South Africa, on account of absence of good roads and navigable streams, is particularly so. The present Cape Colony system of railroads is divided into four sections—the western, northern, midland, and eastern. The western starts at Cape Town and extends to De Aar, 501 miles. At De Aar the northern section begins, and extends through Kimberley and along the western border of the Orange Free State to Vryburg. At the latter place the Rhodesia road begins, running on through

RAILWAYS IN SOUTH AFRICA

By courtesy of *The Engineering Magazine*

Mafeking to its present northern terminus, Bulawayo, 1,360 miles from Cape Town. The midland section consists of a line from Port Elizabeth (with a short branch from Port Alfred) to Norvals Pont, on the Orange River, where it connects with the Orange Free State line running north to Bloemfontein, and on through Johannesburg to Pretoria. This road runs through the heart of the Boer Republics. The eastern section runs from East London to Aliwal North, near the Orange River. The western and midland sections are connected by a line from De Aar, on the former, to Naauwpoort, on the latter;

the midland and eastern by a line from Rosmead Junction, on the former, to Stormberg Junction, on the latter. The eastern section is also connected with the Orange Free State line by a branch running from Albert Junction to Springfontein, a short distance from the Orange River, in the Orange Free State. It crosses the river at Bethulie Bridge. These roads have numerous branches in Cape Colony, so that the British are fairly well supplied with railroads south of the Orange River, but the Orange Free State line beyond Springfontein is the only line running north through Boer territory. The distance from Cape Town to Bloemfontein is 750 miles, while from Port Elizabeth to Bloemfontein it is 300 miles less.

There is a railroad running from Durban, on the Indian Ocean, in a general northwesterly direction. At Ladysmith it branches, one branch going northwest from Ladysmith through the mountains into the Orange Free State; the other branch runs north from Ladysmith through the apex from Natal, then turns to the northwest and goes to Johannesburg and Pretoria. By this line Ladysmith is 180 miles from Durban, and Pretoria is 511 miles.

Still farther to the north a railroad runs from Delagoa Bay in a westerly direction to Pretoria. This road runs through Portuguese territory, and is the only means of access to the sea from Boer territory. It will thus be seen that one system of roads gives transportation from the south to the Boer country, while the other at Durban gives it to the northwest. There is no communication between these systems, and troops and supplies for Natal must be landed at Durban.

THE RAILROAD FROM BEIRA

The permission recently given to England by Portugal to transfer troops through Portuguese territory has directed attention to a line of which very little is generally known. This line starts from Beira, a port on the Indian Ocean about 850 miles north along the coast from Durban, and extends in a general northwesterly direction *via* Umtali to Salisbury. Here the road ends. If the troops sent by this route are intended as an expedition for the relief of Mafeking, it will be some time before they can reach it, as they will have a march of about 300 miles over the country to Bulawayo, the present northern terminus of the Rhodesian railway. This expedition can hardly have any other object, as Salisbury is about 300 miles north of the northern border of the Transvaal and about 600 miles north of Pretoria, and no part of this distance is covered by railroads.

The Boer Republics form an irregular oval. The major axis, nearly parallel to the coast line of the Indian Ocean, is about 440 miles, and its minor axis, represented by a straight line from Mafeking to the apex of Natal, is about 290 miles. The eastern frontier of the South African Republic abuts on Portuguese territory. With this exception, the Boer Republics are entirely surrounded by British colonies.

MILITARY OPERATIONS IN NATAL

The geographical situation of Natal peculiarly favors the Boers. The northern part forms almost an equilateral triangle. The northwestern side is the Orange Free State boundary, the northeastern that of the South African Republic. In anticipation of war the various Boer commanders had assembled at various convenient points along the frontier, and, the morning after their ultimatum expired, made their entry in several different columns into British territory. To prevent the cutting off of the British forces in northern Natal and to effect a concentration at Ladysmith, the British were obliged to attack the Boers, who, on the offensive strategically, were on the defensive tactically, with great advantage to themselves. The actions of Glencoe, Elandslaagte, and Rietfontein were fought, and the net result of this series of movements was the cutting off of Sir George White's army and the investment of Ladysmith. The selection of this place was probably made as it is a railway junction and large quantities of supplies had been collected there. From a military point of view, it had little else to recommend it. Though at an altitude of about 3,300 feet, it lies relatively in a basin, being commanded by higher ground on all sides, notably by Lombard's Kop, a little north of east, and Isimbulwana to the southeast, both within range of the guns mounted there by the Boers.

The subsequent operations in Natal due to Buller's advance to the relief of Ladysmith were also greatly influenced by the topographical features. The line of advance was, under the conditions existing, necessarily restricted to the railroad running north to Ladysmith. None knew this better than the Boers, and they took full advantage of their knowledge. Good defensive positions abounded, and they could be prepared in advance. If the Boers were driven back from one, after inflicting much greater loss than they themselves suffered, they had another good position a little in the rear. When Spion Kop was taken by the British after hard fighting, it was thought by the officer in command on the ground untenable on account of the

positions held by the Boers just beyond, and he ordered its abandonment, though this withdrawal was afterward adversely criticised by Lord Roberts. If the British tried to make a flank movement, they found the Boers too quick for them, and instead of a flank attack they found themselves making a frontal one.

So it will be seen that, due to the natural features, Natal is an extremely difficult country for offensive military movements. It is open to question whether, had not a part of the Boer forces been withdrawn to meet Lord Roberts' advance in the Orange Free State, Buller would have been able to relieve Ladysmith at all.

MILITARY OPERATIONS IN THE ORANGE FREE STATE

In the western part of the theater of operations the ground is principally open veldt, but kopjes and ridges are found here and there affording excellent positions, as was shown in the operations of Lord Methuen's column for the relief of Kimberley. Here again the line of advance was confined to the railroad, and Methuen felt obliged to attack the Boers in the position of Magersfontein, just to the east of the railroad. He was defeated with great loss, retired to the Modder River, and no farther advance on that line was made until Lord Roberts' flank movement compelled the Boers to withdraw from their position at Magersfontein and raise the siege of Kimberley.

There is very little timber in the Boer Republics, and what there is is found principally along the watercourses. As has been stated, many of the streams run through gullies, with steep banks, and when the rivers run dry a wide boulder-strewn ravine is left. It was in such a place that the Boers prepared their ambush recently for a part of Broadwood's command on its march westward from Thabanchu. With proper precautions on the part of the British this surprise would not have taken place; but it is nevertheless a successful utilization on the part of the Boers of the natural features of the ground in a military operation.

To conduct a successful campaign in the Boer territory without heavy losses the British must be able to operate away from the railroad in strong force, and to do this they must have an immense amount of transportation. The country supplies nothing. Everything in the way of supplies must be brought up from the coast. The movement of Lord Roberts, culminating in the capture of Bloemfontein, was very successful, but he spent a long time after his arrival in South Africa before he was prepared to make it. It is estimated

that in this short campaign his loss in animals—cavalry, artillery, and transport—was not less than 10,000. His recent apparent inaction at Bloemfontein has been due to the necessity of making this loss good—remounting his cavalry and artillery and reorganizing his transportation. At present writing it looks as if his preparations were completed, and that important movements may be soon expected.

In addition to the difficulties the British have to contend with in South Africa, there are the cost and delay in sending troops and supplies a long distance by sea. In the matter of horses and mules the home market cannot supply the demand, and large numbers have been purchased in this country for shipment to South Africa.

Another advantage that the Boers have to a remarkable degree, due to geographical conditions and the systems of transportation, is the ability to move on interior lines. Controlling the Natal railroad west and north of Ladysmith, they can move troops from Natal entirely by rail *via* Pretoria to the vicinity of Bloemfontein, or can move them *via* Van Reenan's Pass into the Orange Free State. They can thus with little difficulty concentrate their forces in any part of the theater of operations. In moving troops from the eastern theater of operations to the western, the British, on the other hand, have to take a circuitous route. After the relief of Ladysmith troops were detached from Buller's army and sent to join Roberts. This involved a journey by rail to Durban, loading on transports at Durban, a voyage down the coast, disembarkation at a Cape Colony port, and transfer by rail to the Orange River and beyond.

APPERCEPTION IN GEOGRAPHY

By M. E. Kelton

The application of the inductive method to the various subjects of the school curriculum is encouraging many teachers to undertake a more systematic treatment of geography. In order to help the child to understand what distant lands are, we must store his mind with concepts based upon frequent observations of his own home and its surroundings. For this reason instruction in geography should be based upon the law of apperception. The relation of man to the earth gives wide scope for the study of the causes and effects of their

interaction. By this same inductive method the child is led to work out results for himself, and the subject that was once treated as a memory drill is made to hold its true place in training the reasoning faculties.

In studying the relation of man to the earth three main topics must be considered—the crust of the earth, its fluid and gaseous envelopes, and the forms of life conditioned by the crust and its envelopes.

Because geology, biology, and meteorology are the basis of induction in geography, nature study should precede and form the correlative of geography in the early years of the school curriculum. In these first school days the child works with symbols of language and number. His chief aim is to learn to read. If he reads something in which he is interested the task will be easy. For this reason nature study is made the basis of the reading lesson; and, since nature study is the background of geography, the child is led to such facts as will be of use later in developing the geographic story.

Daily observation of weather teaches relation of winds to cloud and rain. The length of day recorded and compared in different months finally brings a comprehension of the conditions dependent upon revolution, and leads to a final knowledge of and belief in revolution itself. These ideas are strengthened by observing and recording the position of the sun in the sky at morning, at noon, and at evening during the different months. The shadow-stick is presented in the first year. A large nail fastened perpendicularly in a board or a pointer driven into a level path makes a good shadow-stick. Each day's record is marked upon a sheet of paper lying on the board or under the stick, and these records can be brought to class for study. By comparing the results of such observations the principles of mathematical geography gradually become concepts upon which the child can base his further reasoning in geography. Thus he is led to inquire why the noon shadow in June is shorter than the noon shadow in December, and to observe the gradual change in its length.

These simple lessons in mathematical geography are further considered in the reading lesson, where they are illumined by the myth which belongs to the early days of literature; but the myth means much more if associated with a reality. Hence the wind myths and sun myths are read when recording the observations of wind and sun, and the myths of cloud and rain when these phenomena of climate are observed.

Following these observations of climate comes the relation of ani-

mal life to these conditions. In one year's changes the climate of the different zones is fairly represented.

The preparation of plant and animal life for the seasons, the relation of animal to plant, and of man to each is further treated in the nature lesson, such observations being made as will form the basis of the reading lesson that shall follow.

The study of drainage follows the observation of rain. The knowledge of the work of the streams is based upon the observations made during the rain-storm. These ideas may be gained from a field lesson on a railroad cut or excavation in the neighboring hill country. These field lessons are supplemented by careful study of types of rivers and mountains from maps and pictures.

The life in each section visited on the excursions is compared with the conditions of home. In these lessons the land forms are taught, and man's need of clothing, food, and shelter suggests occupations of people. From this study of the organization of human endeavor arises the understanding of the growth of town and city and of the need of government. At this point the story of "Robinson Crusoe" is a valuable and interesting aid as a reading lesson.

During the two years in which nature-work is the basis for the reading lesson ideas are developed which are to be utilized by the true geography teaching that belongs to the course of study in the third year. The main difficulty is to arrange the study to meet the capability of the pupil. Our own adult notions in geography are largely gained from maps, which we enlarge by means of acquired concepts. Why not teach geography by this method? Experience has taught that the study of a lesson from the text is mechanical and void of the desired effect to the majority of the pupils. Now, the search for facts from the map creates interest, and the recording of such facts stimulates thought and furnishes material for the recitation that follows. The reading of the text book in a later recitation illuminates the ideas that have been gained by the individual efforts of pupils.

In the end the written lesson will be the compilation of such facts as have been gained through individual investigation. The answers to carefully prepared questions will appear in the note books of the class as an original geography text book that has grown out of the actual observation and reasoning of the pupils.

The Excursion.—As the neighborhood furnishes the fundamental concepts upon which we build, it follows that the first lessons must establish the common body of facts by simultaneous observation.

In a Brooklyn school the excursion and field lesson precede the work on the map. The city is the unit upon which we begin our course of reasoning. By means of concepts obtained from observations of home surroundings we are to gain the ideas of conditions that have developed other great centers of population. In New York we have before us a great commercial as well as a great manufacturing center. Upon these two conditions depends the dense population of Manhattan Island and the surrounding country.

Density of Population.—An afternoon excursion across the bay on a boat of the Brooklyn annex furnishes the facts to be considered in connection with the map of density of population. The island of Manhattan, with its miles of water front, and the several cities grouped about the waters of bay, river, and strait are noted. The signs on the piers and the flags on the ships show the extent of the commerce. Beside the commercial advantages of New York, the conditions of manufacturing are also considered to obtain a proper understanding of the density of population in manufacturing towns. For this purpose we select a shoe factory, where the different parts of the article are being worked upon by many people. The manager tells us how many hands he employs. These facts are afterward considered in a conversational lesson, where attention is directed to the many families dependent upon this factory and to the needs of each individual thereof.

Physical Features.—Another excursion up the Hudson to the Palisades helps to explain the dependence of density upon the physiographical features.

The only text book used is Longman's School Atlas. The home lessons following the excursions are based upon map 16 of that atlas, entitled "Density of Population in United States." The pupils find the density in southeastern New York and note other localities having similar density. They compare the situation of such places with that of New York City, using map 11 for a better understanding of the physical features. Then they find on map 16 regions having a low density of population and note their physical conditions.

Composition.—A composition on population based upon the facts gathered on the excursion and from the map is next prepared with much careful attention and is preserved in the pupil's note book. This may be illustrated by pictures collected by the children to show conditions of life accompanying the different degrees of density. A map colored to show region of greatest and least density further emphasizes the lessons and completes the subject.

Climate.—Lessons upon climate, with experiments and map study, follow. The rain gauge is observed and a record of the rainfall is made to show how the annual amount of moisture is determined. Such observations are accompanied by others on wind, temperature, and the appearance of the sky. After the pupils have become familiar with such facts as these observations furnish, they extend the bounds of their knowledge by the study of climatic maps.

Rainfall.—On the rainfall map, number 15, the pupils find the annual precipitation about New York City and select other regions having the same amount. By the aid of map 11 a list of cities in these regions is made: also the density of population in each region is compared with that about New York City. Regions having less rain than New York and those having more are compared with New York as to density of population.

Temperature.—The use of the thermometer is taught before the map of isotherms is presented. The symbols on the United States weather map are used to record the observations, and this map is understood before the work on the atlas map is given. After gaining these facts, a further comparison is made of places differing in density of population, and reasons for the varying density are deduced from the climate and surface of each region.

Vegetation.—A visit to Washington Park furnishes the first common ideas of vegetation. Satisfactory types of forest, prairie, desert, and marsh are all to be found there, and here also the conifer of the cold climate, the palms of the tropics, and deciduous trees of the temperate regions have each a representative.

In the subsequent lessons on vegetation the pupils use map number 7, and make lists of the kinds of vegetation found in North America. They color an outline map of North America to represent the vegetation regions. From other maps of the atlas the pupils discover and record temperature, winds, rainfall, physical features, and density of population in each region of vegetation.

The first work, then, in map reading is associated with the previous field lesson or experiment. Since the maps and plates of the atlas are the medium through which the geographical facts of continents and political divisions are to be gained by pupils, our first work in geography, as outlined above, is an introduction to these symbols. In this connection I wish to acknowledge the valuable suggestions I have received from the teachers' edition of Leete's Exercises in Geography, a little book containing exhaustive material for such map studies.

The work of induction is further pursued by means of wall maps and pictures. The pilot charts recently distributed by the U. S. Coast and Geodetic Survey of Washington have aided the study of coasts. By means of these a comparison of the Atlantic and Pacific coasts has been more definitely considered. This has been followed by a deduction of the facts affecting the conditions of life dependent upon each. Such facts are again referred to in connection with coasts of other continents.

Geology.—The geologic map, number 14 of Longman's Atlas, is introduced after an excursion to the beach at Coney Island. On this trip we consider the aqueous deposit of the shore and the surrounding topography. On another excursion a cut in the road furnishes ideas of glacial deposits, and stereopticon pictures afterward supplement the results of direct observation. By means of the geologic map the pupils are able to distinguish the varying formations found in the Atlantic plain. The rocky coast of the north with its phenomena is contrasted with the life and formations of the sandy coasts.

Other Continents.—A thorough acquaintance with home geography paves the way for work upon the continents. The idea of distance is continually brought out in the map study. By means of the scale of miles the extent and area of regions are measured. These ideas are made clear by comparison with distances actually traveled. Hirt's pictures, a German publication, carefully prepared, show life and customs in the geographic regions of the earth. By questioning on these pictures the pupils are led to discover many facts. When the text-book is presented at the end, to review the facts already gained, the pupils read with interest.

Opportunity for Invention.—The great flexibility of the atlas work is apparent whenever an attempt is made to arrange the map lesson to meet a different set of facts. Thus, in order to emphasize the dependence of climate upon topography in the study of Eurasia, the east and west trend of the highland area is noted and the climatic maps used to discover why vegetation and density of population differ from these in the same latitude of the western hemisphere. Here the pupil finds a new factor influencing climate and conditions of life. Again, special sections are compared by exercises that bring together facts regarding their climate and life. The ideas of life on the floodplain of the Po are gained from atlas maps and by comparison with the work of a previous year upon the flooded area of the

Mississippi. The map shows the sand bars, swamps, and lagoon at the delta, where the continental shelf is also apparent. Such a region had been seen in miniature on the Coney Island beach. The cities of Ravenna and Adria, indicated as small towns in the midst of swamps, stimulate the pupils to deduce reasons for the scanty population as well as for the present location. The situations of towns on the banks of the upper Po are contrasted with that of those of the lower Po located a few miles from the river banks. Pictures showing dikes on the lower river are presented and similar conditions on the Mississippi are recalled. The malarial districts and rice-fields shown on the map of Italy are facts upon which the ideas of climate, vegetation, and occupation are based. The railroads are then located on the atlas map and made to furnish data upon which are based the reasons for the density of population and the growth of towns and cities. The passes in the Alps, the opening on the eastern frontier, and the geographical position of Italy are all means by which are deduced facts concerning the various invasions of Italy and the subsequent history of the Italian people. The plate of Races and Religions (map 8) are presented in this history work.

Home Study.—By continually searching for facts the individual mind is stimulated and pleasure is derived from the work. It is the only method I have found to reach the individual in his home study. Each week papers of questions are presented to the pupils. The answers are to be found in the maps and plates of the atlas. The ideas thus gained by the pupils are used as the topic of the class recitation. With pictures and wall maps the thought contained in the pupil's notes is discussed before the reading lesson is attempted. The pupil's note books contain the original text that has been acquired by means of field and atlas work.

Summary.—Briefly summarized, the work consists of: First, direct observation of geographical subject-matter as it occurs in the neighborhood of the school; second, class-room discussion of the observed facts; third, written home lessons on questions based on the previous work; fourth, oral and written reproduction; fifth, reproduction in map form.

And in conjunction therewith a similar sequence of lessons is based upon the atlas and other maps, of physical features, temperature, winds, rainfall, vegetation, productions, density of population, races, and religions. Investigation, adapted to the capacity and develop-

ment of the pupils, is made into the nearer and the more remote causes and effects, especially causes.

The results have been a quickening of interest on the part of the pupils, the development of more thorough method on the part of teachers, and the elimination of many features of work which had hitherto tended to debase geography as a study and to blunt the intellect of the pupil. Self-help through a series of exercises logically related and leading to an independent result is perhaps a good epitome of the plan that we follow.

ICE CLIFFS ON WHITE RIVER, YUKON TERRITORY

By C. Willard Hayes and Alfred H. Brooks,

U. S. Geological Survey

The article by Martin W. Gorman on Ice Cliffs on the White River, Yukon Territory, published in the March number of the National Geographic Magazine, contains several erroneous statements and unwarranted conclusions on which we want to make some comments, not in a controversial spirit, but entirely in the interest of correct geographic information. It may be stated at the outset that one or both of the writers have examined and mapped the White River from its source to its mouth.

In the first place Mr Gorman's distances are incorrect, the length of the White River from where it emerges from the northern lobe of the Russell Glacier to its confluence with the Yukon is approximately 200 miles, instead of "rather more than 300 miles." Instead of "crossing White River about 200 miles above the mouth," the point reached by Mr Gorman could not have been more than 100 miles above the mouth.

While* it is undeniably true that the maps of White River basin leave much to be desired, it seems equally true that Mr Gorman was either unfamiliar with the maps which are available or unable to make proper use of them. It appears likely that the Donjeck River was mistaken for the main trunk of White River, and the latter for the Katrina, an insignificant tributary which enters from the west 70 miles

*Compare maps accompanying article entitled "An Expedition into the Yukon District," by C. Willard Hayes, Nat. Geog. Mag., vol. iv. Also map 10 in "Explorations in Alaska, 1898," U. S. Geol. Survey, 1899.

below the Donjeck. The Klotassin is not "the chief eastern tributary of the White," but is much smaller than either the Klutlan or Donjeck. The latter itself receives an eastern tributary, the Kluantu, which is larger than the Klotassin. This confusion in identifying the rivers of the region, and the exaggerated estimate of distances, together with the air of confidence which pervades the article in question, render it very misleading to the geographic student.

Coming to the main point of the paper, the alleged ice cliffs, it appears that Mr Gorman has mistaken the permanently frozen silt in which the river channel is cut for beds of ice, such as were described by Cantwell on the Kowak. The frozen silts and subsoils are characteristic of the Arctic and subarctic regions, and may be observed on almost any stream in the Yukon basin. It is difficult to understand why a solidly frozen subsoil should be less favorable for the growth of forests than a layer of clear ice, and indeed Lieutenant Cantwell* describes the ice strata of the Kowak as covered by a few feet of soil bearing "a luxuriant growth of mosses, grass, and the characteristic Arctic shrubbery, . . . and a dense forest of spruce trees from 50 to 60 feet high and from 4 to 8 inches in diameter." The "depauperate condition of the trees" described by Mr Gorman must therefore be explained by some other cause than the presence of subjacent ice-strata or a frozen subsoil.

On the Lower White, some eight miles from its mouth, one of the writers had opportunity to examine a bluff of frozen silt, of which some 20 feet was exposed by the cutting action of the river. A dense growth of vegetation was found above the frozen silt, including many large spruce trees. Even if masses of clear ice were found in that portion of the White River Valley visited by Mr Gorman they could scarcely be regarded as glacial ice, since the region lies mostly outside the limit of general glaciation and bears few, if any, marks of the former presence of local glaciers. It is conceivable that masses of glacial ice might be preserved for an indefinite period in the subarctic climate of Alaska if covered by a thick layer of insulating material, such as moss. It is observed, however, that sand and gravel do not form an efficient non-conductor, and that where the soil is laid bare by burning off or otherwise removing the moss the subsoil thaws out to a considerable depth. Since ice masses at the margin of a glacier are at first covered only by sand and gravel, the chances of their preservation until covered by vegetation are small.

* Nat. Geog. Mag., vol. vii, p. 345.

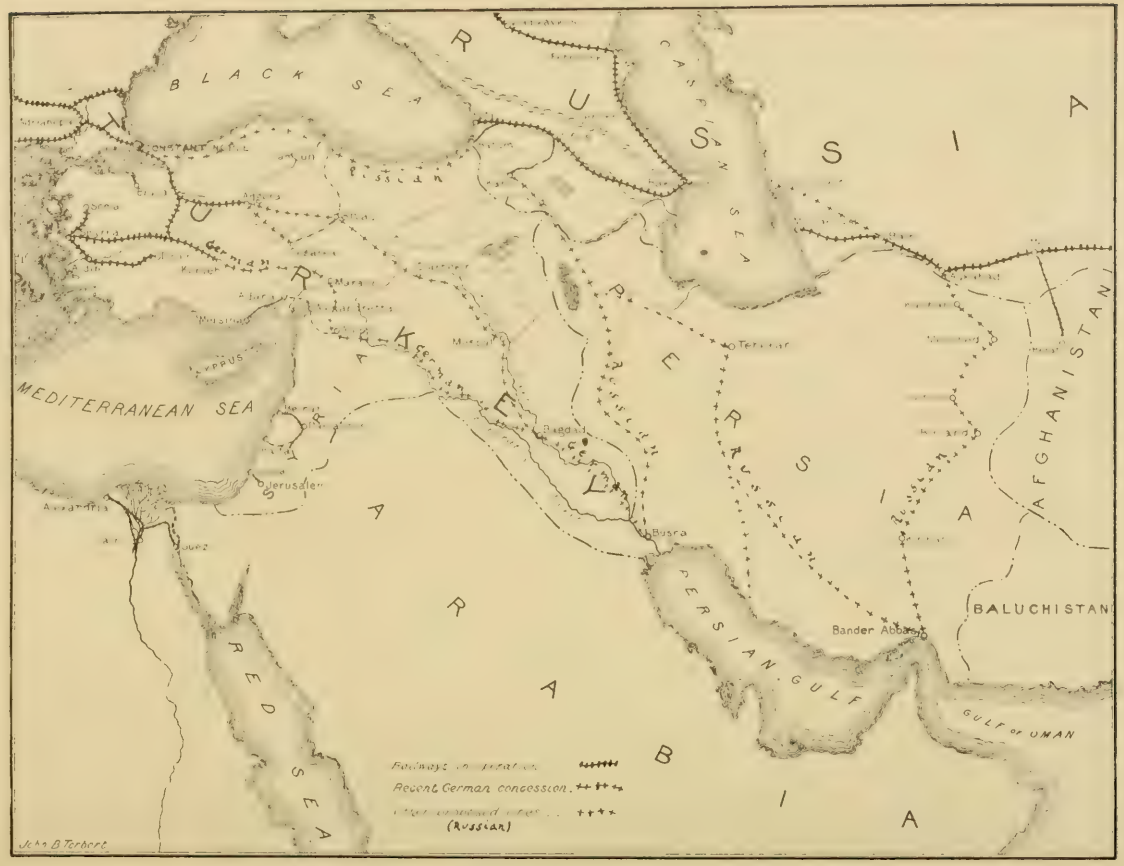
If a concise definition of a glacier be accepted, such isolated masses of buried ice would hardly be included, being in fact a part of and closely related to the frozen subsoil which is found nearly everywhere in the Arctic province. Moreover, the deposits which overlie the ice, as described by Mr Gorman and observed by the writers, are soils and silts, and entirely non-glacial. If these ice masses were buried remnants of former glaciers, then would be associated with them glacial material.

Speaking of recent volcanic activity in the valley of White River, Mr Gorman makes the surprising statement that not a trace of the volcanic ash which forms so noticeable a feature at the banks of the Yukon is to be seen along the banks of the White, except near the mouth. If he had possessed even a slight familiarity with the region in question or with the literature* of the subject, he would have known that many hundred square miles in the Upper White River basin are covered with this volcanic ash, with many local drifts from 50 to 100 feet in depth. The ash covers both valley bottoms and mountain tops.

The thin stratum shown in the banks of the Yukon is merely the attenuated eastern edge of the deposit which reaches its maximum in the region from which Mr Gorman says it is entirely absent. We entirely agree with his dissent from Heilprin's theory that the ash was deposited in a lake bed covering the upper Yukon basin, but on quite different grounds from those which he adduces.

A final case of superficial observation remains to be noted. Mr Gorman states that the water of White River is "surcharged with a mixture of fine blue clay and granitic sand" which gives it the characteristic white color from which it derives its name. Many of the upper tributaries are glacial streams, and hence carry rock flour and glacial pebbles like other streams of similar origin, but this constitutes only a small proportion of the sediment. Much the larger part consists of the light pumiceous volcanic ash which covers the upper half of the basin, as was proven by a microscopical examination of the sediments. Being entirely unconsolidated and only in part covered by vegetation, it is rapidly eroded, and on account of its low specific gravity large quantities of relatively coarse material remain in suspension in the water.

*An Expedition Through the Yukon District, pp. 146-150; Explorations in Alaska, p. 69.



MAP SHOWING RAILWAYS CONSTRUCTED AND PROPOSED IN ASIA MINOR AND PERSIA

A GERMAN ROUTE TO INDIA

Every move of Russia toward India is watched and studied the world over. But another power is aiming eastward, unnoticed—not urged by an ambition for territory, but impelled by a desire for commercial supremacy.

For ten years the German Emperor has puzzled Christian nations by his evidences of brotherly love for the Sultan of Turkey; but gradually German commerce has invaded the Turkish Empire; German commercial agents are favored everywhere; German capital obtains first concessions from the government in mining, for factories, in every industry. German bankers have acquired control of the main railway lines in Asia Minor, arranged for direct trains daily from Berlin to Constantinople, and then sought the right to extend the Smyrna-Konieh Railroad to the Persian Gulf. The concession has been granted, the route carefully surveyed, and the company guarantees that the road will be completed within eight years.

When the railway is constructed Berlin will be within five days of the Persian Gulf. German merchandise can then be sent without change in freight cars from Berlin across the Bosphorus, through Asia Minor to Busra, whence steamers can reach Karachi and the mouth of the Indus in 48 hours.

In a political sense a railway through Asia Minor will not be of great immediate importance to Germany, but the building of the road by her capital and under her patronage may end in her acquiring a commercial port at some point on the Gulf. Probably the main result will be the strengthening of the alliance between the Emperor and the Sultan. The purpose of this political friendship is still an enigma, but evidently the Emperor aims to obtain for Germany a route to India distinct from either the English or the Russian route. The construction of a railway through Asia Minor is an important step in this direction.

The Ottoman Empire will naturally profit from a line connecting its capital with its richest and most productive provinces. The organization of its military forces will be facilitated, as the larger proportion of the Turkish soldiers come from the interior provinces. While the new railway will not follow the direction preferred by the Sultan, namely, toward Armenia and the Caucasus—a route that would

enable him to concentrate his troops where they could most advantageously resist a Russian advance—it will enhance his power in another direction. Today the Sultan is a negative factor in the contest for influence on the Persian Gulf; but with a road through Asia Minor he will become a considerable, if not prominent, force in any partition or settlement of the possession of the Gulf. The road would enable him in a few days to mobilize his army of a quarter of a million men either at Constantinople or Busra.

To England also the German route ought to be an advantage. To be sure, it makes Germany her competitor in the Indian markets; but this competition is more than balanced by the new demands that will constantly be arising. The markets should be large enough for both English and German merchants. Politically, however, it will be more important for Great Britain to maintain her friendship with Germany, and possibly render it advisable for her to endeavor to regain the alliance of Turkey.

That Russia is intensely interested in a German railway to the Persian Gulf has been repeatedly emphasized by the actions of the Russian Government since the concession was granted in 1899. First, she demanded of Turkey prior railway concessions on all lines through Asia Minor to the north of the German concession. Recent reliable reports from Constantinople state that the Sultan has been compelled to yield to the demand. This concession includes a line from Batum to Constantinople, skirting the shores of the Black Sea. Second, she has renewed her plans for the continuation of the Trans-Caucasian Railway from Kars in a line almost directly southward to some point on the Gulf near Busra. There is a probability that this railway may be completed before the German road. Third, she is pushing across Persia several lines that are also to end at the Persian Gulf. The general direction of these roads is indicated on the map (page 202), and they also will probably be completed before the German road becomes a fact.

The recent rapid increase of Russian influence in Persia, a striking instance of which is the loan to the Shah, has been in large measure occasioned by the present inability of England to interfere. But the prospect of a railway controlled by another power and terminating on the Persian Gulf has quickened Russia's ambition to reach the Indian Ocean.

GILBERT H. GROSVENOR.

THE CUBAN CENSUS

The results of the Cuban Census, in many respects unexpected, show on the whole a gratifying condition of affairs in the island. The accompanying diagrams emphasize the more important facts. From the relatively large proportion of native-born whites, 58 per cent of the total population, it is evident that the administrative control will remain in the hands of the native white Cuban when the United States withdraws from the island. Thus Cuba will not become a second Haiti.

DIAGRAM SHOWING POPULATION BY COLOR

The right to vote at the municipal election June 16—a right gained by the ability to read and write or by the ownership of property—is possessed by about 140,000 native Cubans. As so many citizenships were in suspense at the time the census was taken, it is impossible to state exactly how many Spaniards will also have the right to vote, but they will not exceed 30,000, if they reach that number.

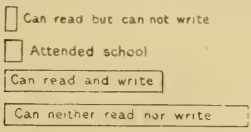


DIAGRAM SHOWING LITERACY OF THOSE TEN YEARS AND OVER

Of the total population of 1,572,797, 1,108,709 are single, 246,350 are married, and 131,788 live together as husband and wife by mutual consent. In justice to the Cuban, however, it should be stated that unions formed by mutual consent are considered no less binding and are no less permanent than those sanctioned by the marriage ceremony.

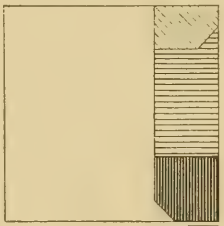
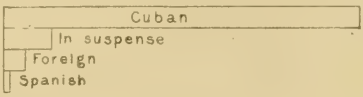


DIAGRAM SHOWING CONJUGAL CONDITION



The excessive fees charged for weddings, perhaps, explain the frequency of the omission of the ceremony.

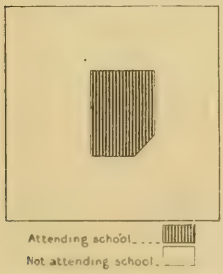


DIAGRAM SHOWING PROPORTION OF THOSE UNDER TEN YEARS OF AGE ATTENDING SCHOOL

The census returns show the need of a thorough system of education. Of persons over ten years of age, 43 per cent cannot read or write, while only 11.4 per cent of the children under ten years are attending school.

FRANK HAMILTON CUSHING

Frank Hamilton Cushing died at his residence in Washington, D. C., on April 10, 1900. From his boyhood he had been the friend and student of the American Indian. In 1875, when only 18 years of age, he was commissioned by Professor Baird, Secretary of the Smithsonian Institution, to make collections for the National Museum. The years of 1879–1885 he lived among the Zuni Indians of New Mexico, he learned their language and traditions, and was initiated into their esoteric priesthood and elected their war chief. Thus he was able to learn the character of Indian secret societies. Mr Cushing discovered the ruins of the Seven Cities of Cibola in 1881, and later conducted excavations among them and the great buried cities of southern Arizona. In 1895 he discovered extensive remains of a sea-dwelling people on the gulf coast of Florida, and the following year led an expedition thither. At the time of his death he was prominently connected with the Bureau of American Ethnology. He was the author of numerous monographs and papers on the myths and customs of the Zuni and the prehistoric races of New Mexico, Arizona, and the Southern States.

GEOGRAPHIC LITERATURE

The International Geography. By seventy authors. Edited by Hugh Robert Mill. 8vo, pp. 20 + 1088, with 488 illustrations. New York: D. Appleton & Co. 1900. $3.00.

This book is a terse and comprehensive description of the earth and of the various countries of which it is composed. It is divided into several parts, of which the first relates to the earth as a whole, with chapters on principles and progress of geography, mathematical geography, maps, plan of the earth, nature and origin of land forms, the ocean, atmosphere and climate, the distribution of life, and political and applied geography. Succeeding parts are devoted to descriptions of continents and countries. These, as well as the chapters of Part I, were written by different authorities, and the result, owing doubtless to excellent planning and able editing, is fairly uniform. Here and there the personality or bias of a writer appears, but not often or obtrusively.

The apportionment of space among the various countries is very well arranged: To the United States are assigned 64 pages, to Canada 25, to Great Britain 59, to France 22, and to Germany 32. The list of authors includes such names as Bryce, on Natal, the Transvaal, and Orange Free State; Chisholm, on Europe and China; Davis, on North America and the United States; Keane, Keltie, Lapparent, Markham, Murray, Nansen, and Penck.

The descriptions of countries are brief, succinct, and encyclopedic in form, though not in arrangement, and each is followed by tables giving summary statistics of areas, population, and industries. As a book of reference this work is of great value.

North American Forests and Forestry. By Ernest Bruncken. New York: G. P. Putnam's Sons. 1900.

This book deals more particularly with the relation of the forest problem to the natural life of the American people. With this object in view, Mr Bruncken's choice of subjects and the general outlines of his treatment are in most respects admirable. After a brief introduction, in which his purpose is defined, he begins with a discussion of the North American forests, of the relation between man and the forests of this country, of forest industries, and of the destruction and deterioration of the forests. He is then ready to deal with the nature and object-matter of forestry, the finance and management of forest lands, the relation of forests to the government, and the difficulties which beset the practice of forestry (conservative lumbering) in the United States. A final chapter, which will be much read by the numerous young men who are turning their attention to this new line of possible work, treats understandingly of forestry as a profession.

Mr Bruncken's book is much better calculated than any other with which I am acquainted to convey a correct general idea of the forest problems of the United States. He has seized the principal facts in the situation with intelligence and has set them forth in a way easily understood. If there is to be criticism of so useful a book, it should be directed chiefly against the fact that the author's conception of the forest problems of the United States is much too strictly limited by his acquaintance with those of the white pine states about the headwaters of the Mississippi. It is to be regretted also that there is a lack of accuracy in detail. For example, the silvicultural notes in the second chapter are much too frequently based on the facts of European rather than of American forests, or upon an imperfect knowledge of the latter. There is a similar lack of precision in many parts of the book. However, since Mr Bruncken expressly says that his book is not intended for professional foresters, the blemish of such misconceptions is less great than it would otherwise be. On the whole, Mr Bruncken's book promises well both for its own present utility and for the future work of the writer. GIFFORD PINCHOT.

Tarr and McMurry's Geographies. First book. Home Geography and the Earth as a Whole. By Ralph S. Tarr and Frank M. McMurry. Small 8vo, pp. xv + 279. New York and London: The Macmillan Co. 1900. 60 cents

This little book, the first of a series of geographical text-books, is an attempt to combine the inductive and deductive methods in the teaching of geography. The first 107 pages are devoted to developing, from the home surroundings, a knowledge of the formation of soils, mountains, valleys, and rivers, the phenomena of the sea and air, and, finally, industries and government. With all this as a preface, the remainder of the book is a description of the earth as a whole and of its parts, much as in the older elementary geographies. The style throughout is admirably adapted to holding the child's interest, while imparting information. The text is freely supplemented with questions and suggestions, and the numerous maps and cuts are very illustrative and finely executed.

It will be interesting to learn the measure of success attained by this experiment in geographic text-books. If unsuccessful, it will be a failure of the principle, not of the form, for the latter is in all respects nearly faultless.

GEOGRAPHIC MISCELLANEA

The Weather Bureau service is to be extended by the establishment of observatories in all Mexican Gulf ports between Tampico and Progreso. They will be under the charge of the weather officials at Galveston, Texas.

The Indian famine has increased to such an extent that it now affects an area of territory in which there is a population of over 60,000,000. The government gives relief work to about four millions, and food to five millions more.

Dr Nansen will lead a scientific party to the northern seas this summer for the study of the ocean currents in the vicinity of Iceland. The expedition, which is organized under the auspices of the Norwegian government, will return in the autumn.

The work of testing arctic currents by setting wooden casks adrift on the ice north of this continent will be continued this year by the Geographical Society of Philadelphia. Each cask contains a bottle having in it a blank form to be filled out by the finder. The work was begun by the Society last year at the suggestion of Admiral Melville.

In view of the imprisonment of General Cronje and other Boer officers at St Helena, it may be interesting to know that a submarine cable has been laid from Cape Town to the island, where it was landed in November, 1899. The present tariff is $1.70 per word, but on the completion of the line the rate will be reduced to 97 cents to England.

Mr Grove Karl Gilbert, of the United States Geological Survey, President of the American Association for the Advancement of Science, and a frequent contributor to the National Geographic Magazine, has been awarded the Wollaston Medal for 1899. This medal is given annually by the Geological Society of London for the most important geological discovery of the year.

The number of vessels that passed through the Baltic Canal during the twelve months ending March 31, 1899, was 25,816, with an aggregate tonnage of 3,117,840. This was an increase of 2,708 ships and 648,045 tons over the preceding year. The total receipts amounted to $388,000, and while this was an increase of 25 per cent over the previous year, it still fell short of the cost of maintenance by $103,800.

The death is announced of Mr Brandt, the chief engineer in charge of the work of digging the Simplon Tunnel through the Alps, which will open a new route between north and south Europe. Mr Brandt was the inventor of the hydraulic rotary drilling machine with which the work is being done, and also of an ingenious machine for removing the débris after the blasts. This machine throws a powerful stream of water by jerking impulses into the stones loosened by the blast and thereby loosens the dirt. Another invention of Mr Brandt's, a system of ventilation, has been tried in the mines in Spain and has proved effective. The excavation of the Arlberg Tunnel in 1867, through which railroad communication is made between Switzerland and Austria, was directed by Mr Brandt.

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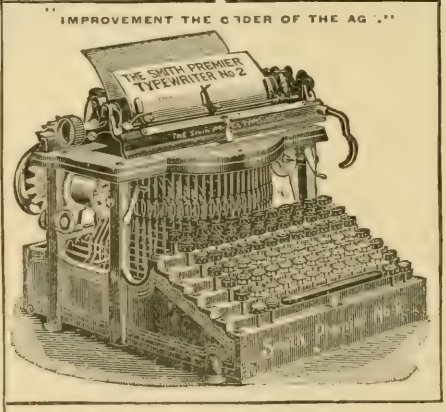

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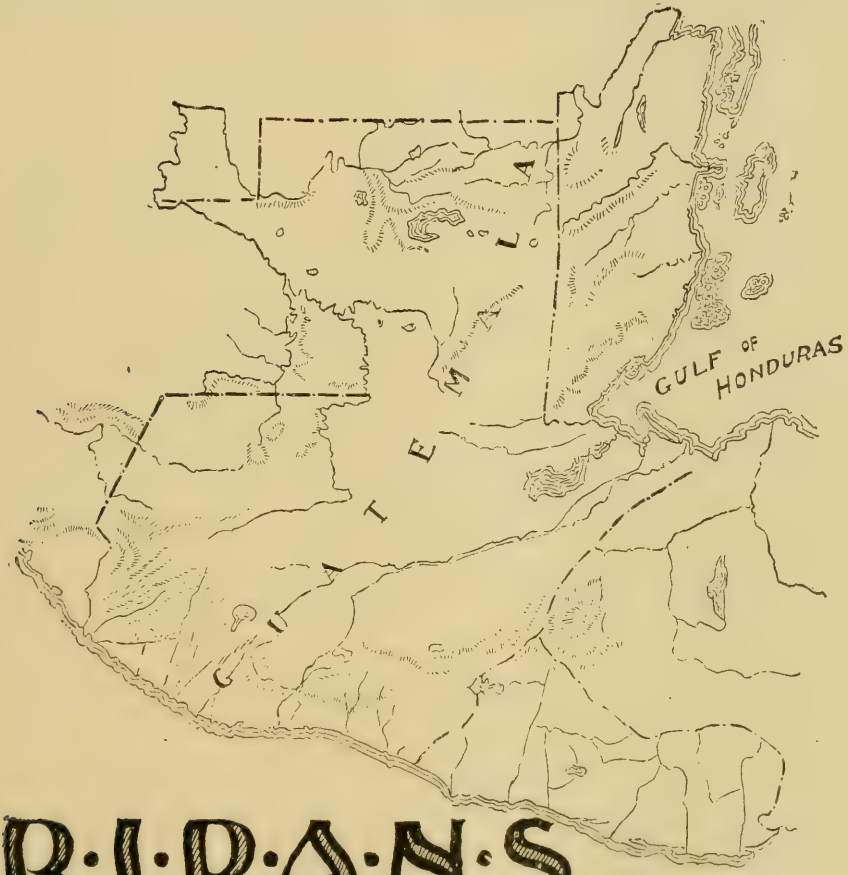

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ANNOUNCEMENTS OF THE NATIONAL GEOGRAPHIC SOCIETY.

All announcements of the Society are published regularly in the NATIONAL GEOGRAPHIC MAGAZINE.

THE ANNUAL RECEPTION. The Board of Managers has deemed it advisable, in view of the proposed excursion to Norfolk, Virginia, on May 27-28, to substitute for the formal Annual Reception an informal meeting of the Society, at which eclipse phenomena and methods of observation will be discussed by well-known astronomers. The meeting will be held at **National Rifles' Armory Thursday, May 3, at 8 P. M.**

SHORT DISTANCE EXCURSION, SATURDAY, MAY 12. Persons taking part in this excursion will proceed by electric cars to Anacostia and thence on foot to the top of Good Hope Hill, thence to Fort Stanton and Congress Heights, returning on the electric cars from the latter point. The party will rendezvous at the east end of Anacostia Bridge at 2 P. M.

An account of the physical development of the District of Columbia region, all the prominent features of which can be viewed from Fort Stanton, will be given, and attention will also be devoted to the historical features. Special invitations for this excursion will be extended to teachers of physical geography in the public schools of this city. There will be no expenses except for car-fare. Omnibuses will be on hand for the accommodation of those who do not care to walk up Good Hope Hill.

SHORT DISTANCE EXCURSION, SATURDAY, MAY 26. This excursion will be a trip to Bladensburg and return. Persons intending to join the excursion will rendezvous at the corner of 15th and G Streets at 1.30 P. M. This trip promises to be of special interest, in view of the historic associations connected with the early history of Bladensburg and vicinity. Attention will be given to the botany, geology, and especially the history of the region visited. The expense will be twenty cents for the round trip.

In case of rain on any of the dates above named, the excursions will be postponed until the succeeding Saturday.

THE ANNUAL FIELD MEETING

of the NATIONAL GEOGRAPHIC SOCIETY has been arranged so that the members of the Society may have an opportunity to observe the total eclipse of the sun which takes place on Monday, May 28. As the center of the belt of totality will pass near Norfolk, Virginia, the board of managers of the Society have made a conditional contract with the Norfolk & Washington Steamboat Company for an excursion to that city and vicinity. The party will leave Washington by the Norfolk & Washington steamer at 7 o'clock P. M., Sunday, May 27. Returning, leave Norfolk at 6 o'clock Monday afternoon, reaching Washington on Tuesday morning in time for breakfast at home.

The total duration of the eclipse will be 2 hours, 34 minutes, and 6 seconds, of which 1 minute and 26 seconds will be total. The eclipse will be entirely over at 10:15.6 A. M., and from that hour until 6 o'clock the steamer will be at the disposal of the party for a cruise around the harbor and visits to the many points of interest around Norfolk, such as the Navy Yard, Portsmouth, Newport News, Fortress Monroe, the Indian Industrial School at Hampton, etc.

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Monday, but not including sleeping accommodations) will be $6. The charge for staterooms, accommodating two persons, will be from $1 to $3 for each person, according to location. The larger staterooms can be made to accommodate 3 persons by placing a cot therein. A charge of fifty cents will be made in such cases. Cots in the main saloon will be charged for at the rate of fifty cents. These rates are for the round trip.

The number of tickets to be sold is limited to 250, and as there are only 90 staterooms, accommodating 180 persons, on the boat, they will be allotted to members in order of their application. Members who desire staterooms or cots should make their reservations as early as possible. A guarantee deposit of $2 on each ticket will be required when the rooms are reserved.

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THE

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NATIONAL GEOGRAPHIC MAGAZINE

VOL. XI JUNE, 1900 No. 6

THE ROAD TO BOLIVIA

By WILLIAM E. CURTIS

It takes seven days to make the voyage from New York to the Isthmus; three days from New Orleans, and two from Tampa; but the latter routes are impracticable on account of the quarantine regulations. There is always more or less fever at the Isthmus. It is difficult to keep it away, because Colon and Panama are filled with human driftwood and are asylums for refugees from plagues, politics, and criminal courts. The last yellow fever was brought to Panama, curiously enough, by seven friars from the Philippine Islands. They are all dead but one. Panama is the home of political exiles, unsuccessful revolutionists, and banished presidents of the Central and South American republics. It has a fine hotel, a number of handsome residences, and no end of ruins, which have been accumulating since the time when the governor of the first colony on the American Continent began a history that has no parallel for conspiracy and intrigue on the American Continent.

Usually the voyage from New York is delightful. People always expect a little weather off Cape Hatteras, but when you pass that unlucky coast and cross the Gulf Stream you put on lighter clothing and rejoice in the trade winds which temper the heat of the tropics. The days and nights are of equal length. The sunsets are as gorgeous as you see on the Mediterranean, and there is no twilight. The sun rises promptly at the time appointed in the almanac, and when his day's work is done he drops below the horizon as a tired sailor tumbles into his bunk.

As an Irishman would say, the first land you see is a lighthouse, striped like a stick of candy, that marks Watlings Island, where Columbus stumbled upon a new world. There is a little settlement of negroes and a white magistrate to represent the sovereignty of Queen

Victoria. After leaving Watlings the steamer treads its way through the Bahama Archipelago, giving the passengers a panorama of coral islands, where the sponge-fishers live, groves of cocoanut trees, and lonely lighthouses that guide the ship to Colon, which from the deck of a steamer is one of the prettiest towns on the coast, but when you get ashore is a disappointment and a delusion. The harbor is inclosed with beautiful hills, whose bright-green foliage never fades, and groups of palms nod lazily to each other as they admire the reflection of their own beauty in the water. The palm is the peacock of plants. It is the most graceful tree that grows, but you can't help despising it for being so vain and conceited.

The railroad company occupies one end of the town with shops and boarding-houses, and at the other end is a group of ornate and elaborate gingerbread villas erected for the comfort of the large and luxurious staff of the canal company. They had clubs, billiard-rooms, libraries, hospitals, and everything that a colony of cultured gentlemen could desire except churches. The French christened the canal company Christo Colombo, but the Americans call it Colon. One of the most beautiful and costly and at the same time inappropriate statues to the great discoverer overlooks the entrance to the canal. It was erected by the ex-Empress Eugénie, and represents Columbus in the garb of a student, with a benign expression on his countenance and his hands resting on the tresses of a crouching Indian girl.

A surprising amount of work has been done by the Panama Canal Company, contrary to an almost universal misconception that exists among the American people. De Lesseps dug two ditches, each about 18 miles in length, from Colon and Panama toward the center of the Isthmus, which are now partially filled with debris. The new company has been working in the interior, cutting through the summit of the continental divide, which here rises only 333 feet above the sea, and, with one exception, is the lowest point of land between Bering Sea and the Straits of Magellan. The great obstacle that stands in the way of the Panama Canal is the Chagres River, which receives the drainage of a large area and is perhaps the most depraved and unreliable stream in existence. There are two seasons, the wet and the dry. For five months it rains a torrent every day, a rainfall of about four feet a month. The remainder of the year there is no rain at all. Thus for five months the Chagres River is a Niagara, and for seven months a shallow, stagnant stream. The problem is to regulate the rainfall so that it will not wash the canal away in the wet season and leave the upper levels without water in the dry.

OPENING PEARL OYSTERS — PANAMA

Panama is one of the oldest and quaintest towns in America. Santo Domingo antedates it a few years, but it was the first settlement on *tierra firme*, and the ruins of the original city still lie on the shore of the bay four miles south as they were left by Morgan, the famous buccaneer, who burned and blew up 7,000 houses. The present city dates back to 1673. In 1849 it was the principal station on the route to California. In 1879 the Frenchmen came with their millions, and everybody had money to burn. Then, after a hysterical period, Panama settled down to the sleepy existence which it still retains. The harbor is beautiful, and a group of islands lying about two miles from the city is the headquarters of several steamship companies which furnish transportation facilities for the west coast of America.

The voyage from Panama south is one of the most fascinating and comfortable that the salt water affords. You are always sure of fine weather, fine ships, and a good sea. It never rains, it never blows, and the swell is not heavy enough to make ordinary people seasick. From Guayaquil to Valparaiso the passengers are almost always in

sight of the Andes, whose feet are buried in the desert lands, whose breasts are wrapped in the foamy clouds, and whose peaks are crowned with spotless snow. The spectacle of the Chimborazo rising like a king among an army of Titans is surpassed by few mountain views, and the scenery during the entire distance is always picturesque.

The temperature south of Panama is much cooler than north of the Isthmus, for the heat is tempered by the Humboldt Current, a cold stream that comes up from the Antarctic zone to cool the atmosphere of the west coast, just as the Gulf Stream brings the warm waters of the tropics to moderate the climate of Europe and North America; for you know that if it were not for the Gulf Stream everybody in New England would be living like the Eskimo and potatoes would not grow in Ireland.

We crossed the equator at six o'clock, Sunday, July 2, 1899. The thermometer stood at seventy-six degrees in the chart-room, on the shady side of the ship, and at seventy-eight degrees in the companion-way leading to the dining-room. On the Fourth of July, three degrees south of the equator, it was seventy-six at noon and eighty-one at four o'clock.

From the deck of the steamer in the evening, Guayaquil looks like a little Paris. It lies along the bank of the River Guayas, and the main street, called El Malecon, stretches for two miles or more from a shipyard to a fortress-crowned hill with two decrepit old guns, which are supposed to protect the harbor. El Malecon appears to be lined with long blocks of beautiful marble and stone, and in the evening is brilliantly illuminated. Here appears a row of palaces, then a group of clubs, and beyond a series of blazing ball-rooms. In the morning from shipboard the illusion is not dispelled, and the view is quite as imposing. The architecture is pure and graceful, much of the Moorish order, and the rest on more delicate lines—long arcades like those on the *Rue de Rivoli* or the *Palais Royale* of Paris, and above them balconies sheltered by blinds and awnings of gay canvas have an oriental look. A little railway, with tiny cars drawn by diminutive locomotives, carries heavy loads of merchandise, cocoa, and sugar between the docks and the warehouses.

An interesting kind of craft on Guayas River was called *caballitos*, or "little horses," which consists of bundles of rushes and reeds lashed together and forming a narrow float or raft that tapers off at one end like a gondola. They are as difficult to handle as a canoe, and are used chiefly for fishing. The *caballitos* look very frail and

dangerous when you see them in the water, but it is impossible to sink them.

When you leave the Guayas River to go southward you strike the "Zona Seca," the desert coast, as soon as you pass the boundary of Peru. The steamer follows the shore as closely as safety will allow. The surf has pounded it until the soft places have yielded and its present outlines resemble the wind-carved cliffs on the American desert, and scattered along are many islands gray with guano, dropped by the millions of water birds that make their home along the way-worn and forbidding shore. There are a few indifferent harbors, but most of the towns lie upon the unprotected beach, and communication between the steamer and the shore is carried on in large launches, made so buoyant that they ride safely through the surf.

A CABALLITOS

Like the arid lands of Arizona and southern California, the desert coast of Peru is rich in vegetable life wherever it can be moistened. About once in a generation a shower escapes from the mountains, and the hitherto lifeless earth is immediately illuminated with fruits and flowers whose germs have lain dormant from remote cycles. In 1892 there fell a series of unprecedented rains. The desert was alive with plants and blossoms where nothing but lifeless sand had been before, and where the seeds came from is a question no one has ever been able to answer.

The steamer stops at every town for an hour or two, long enough to take on and discharge cargo, and the passengers can go ashore and enjoy diversions from the voyage, which are always interesting. We saw funerals and weddings and busy markets and many queer things unique to this locality.

A PANAMA LAUNDRY

Back of the port of Pacasmayo, across the desert and the first mountain range, is the town of Caxamarca, where the traveler may still see the remains of the palace in which Pizarro and his legions strangled Atahualpa, the last of the Incas, and butchered the members of his court after he had filled his prison with gold; and farther down the

coast, below Lima, in the midst of the desert, are the ruins of the ancient city of Pachacamac, the Rome and the Mecca of the Incas, where several square miles of roofless and crumbling walls stand as mute but impressive witnesses of the thorough manner in which the Spaniards civilized the new world.

Pachacamac was the Christ of the Incas, sent by his father, the Sun, to redeem the world, to give life to mankind and all things necessary for their well-being and happiness. But one temple in the entire empire was dedicated to that supreme being, to which pilgrims were continually coming and going, because it was the duty of every inhabitant once in his lifetime to offer sacrifices and worship there; and to be buried in the neighborhood of the temple was the supreme ambition of all believers. Immense buildings, now in ruins, were occupied by priests and nuns, who dedicated their lives to the service of the god, and surrounding them was an assemblage of spacious edifices adorned with enormous wealth, which furnished an irresistible temptation to the avaricious Spaniard. Francisco Pizarro sent his brother Hernando to plunder the city, and amazing stories are told of the silver and gold that he carried away. The ruins of Pachacamac remain as he left them, after he despoiled the temples and palaces and butchered the inhabitants. They are the most accessible as well as one of the most interesting examples of Inca architecture.

Surrounding the city is a cemetery that extends for many miles, where millions upon millions of pious Incas were buried during the centuries that preceded the Spanish occupation. The theory of the resurrection of the body and the immortality of the soul caused them to preserve the dead with great care, and to bury with them the utensils and ornaments which they used in life. Taking advantage of this custom, archæologists and treasure-seekers have excavated large areas in search of mummies, gold and silver ornaments, and other valuable objects that the graves contain. The cemetery has been the scene of such vandalism that it is now a repulsive golgotha, covered with skulls and bleached bones, broken pottery, and the cerements which have been stripped from the dead.

At the foot of the hill, where stood the Temple of the Sun, was a vast building, supposed to have been a convent, in which thousands of women spent their lives spinning and weaving robes for the royal family and vestments for the priests. Its noble walls have made a heroic resistance against time and decay during the four centuries since the Spaniards stripped them of their treasures. Under their

shadows we took our noon-day rest, eating luncheon and talking of the wonders and the mysteries of the sacred place, while a daughter of the Incas brought a bundle of sugar cane upon her back to feed our horses.

The west coast of South America has been called a panorama of desolation, being a constant succession of barren cliffs, with scarcely a lovely thing for 1,500 miles. The town of Mollendo, the terminus of the railway that connects Bolivia and the interior of Peru with the coast, is built upon a rock that extends into the ocean. Ugly looking crags project in all directions and make the landing look dangerous, although in reality they are a protection, by breaking the force of the surf that rolls in unbroken from the wide Pacific; for, as our captain suggested, what else can you expect when you have nothing else but Australia for a breakwater.

Although Mollendo is the second seaport in importance of Peru, the surf is so bad that people cannot always land there. Sometimes passengers on the steamers have to continue to the next port and remain until the surf subsides. At all times the experience of landing is not such as to encourage nervous and timid people, although it furnishes the passengers who are lucky enough to remain on board with some exciting and amusing spectacles.

The water used by the people of Mollendo is brought 85 miles in an 8-inch pipe, which lies partly under ground and partly on the surface of the desert, along the line of the railway from the River Chile which is tapped in the mountains at a height of 7,275 feet above the sea-level. Farther south, at Iquique, they have a similar pipe, which brings the water 148 miles, and that which supplies Antofagasta is 185 miles long. The water is used both for consumption and irrigation, and wherever it touches the soil there springs forth most luxuriant vegetation.

For the first ten miles out of Mollendo the railway runs along the beach; then it enters a *quedebra* or ravine, and begins its weary climb up the mountain side. It passes first through a region of rocks and sand upheaved by some great cataclysm, and continues to wind like a snake in and out of the irregularities of the mountains. There are double curves and serpentines and horseshoes, and at places you can see three or four levels, one above the other, on the same mountain. The first station after leaving the seashore lies at an elevation of 1,000 feet, and there is an average rise of 800 feet between stations thereafter until we reach Arequipa, which is about 8,000 feet above tidewater

There are no tunnels and only one bridge the entire distance, but the heavy construction is continued, the roadway being actually carved out of the rocks with shovels and picks and dynamite. The train creeps along at the rate of 10 miles an hour—an engine and two cars, the first a combination of second-class and baggage, and the other neatly upholstered for the use of the first-class passengers. At the stations piles of freight are awaiting shipment and droves of patient, melancholy burros, with monstrous heads and legs like pipestems, gaze indifferently at the train, as if unconscious of its competition.

At every station there is a long wait, and the passengers alight to buy food of the Indian women, who cook it on the spot. About half way to Arequipa appears a group of splendid mountains—Carachani, which is 20,800 feet; Coropuno, one of the highest peaks in South America, which measures 22,000 feet, and Misti, a slumbering volcano that rises from the desert like a stately dome.

At frequent intervals crosses have been erected where men have died, and there is a ghastly shrine hung with ribs, thigh-bones, skulls, and other melancholy reminders of the uncertainty of human life upon these awful deserts; some of the victims died of disease during the construction of the railway, others perished of thirst or exhaustion while crossing the pampas; all of them were once buried in the sand, but the wind uncovered their bones, which kindly hands have collected and hung about the emblem of the crucifixion.

Upon the desolate pampas of Peru is found an extraordinary phenomenon known as *medanos*—crescent-shaped piles of white crystals rising to a height of sometimes twelve and sometimes twenty feet at the center of the arc, and molded with perfect symmetry. The arms of the crescents are of equal length, and always point to the north. The *medanos* move continually, making an average distance of about 10 feet a month; but each pile keeps its own sand, and in a mysterious manner they never mix, nor do they increase in numbers. Veterans who have been passing over the desert for half a century claim that the number of *medanos* is no greater now than it was twenty-five or thirty years ago.

The valley broadens as you approach Arequipa, and its fertility is shown by an emerald ribbon that illuminates the gloomy grandeur of the scenery. Irrigating ditches creep around the mountain sides and empty their contents over the slopes. Farmhouses are built of loose boulders, without mortar, and are thatched with roofs of straw in the shape of pyramids, over which a coating of clay has been placed

A CENTRAL AMERICAN FAMILY — NICARAGUA

to protect them from the rain and wind. On almost every farm is a circular corral built of boulders, with a stone floor, in which the wheat is trampled out of the straw by the hoofs of the animals; and many other curious and interesting objects are seen on every hand.

Arequipa is a quaint and queer old town, and has the reputation of being the most religious city in the world. Freemasons are not allowed to live there, Protestants are ostracized, and the people devote a great part of their time to religious ceremonies. Again, it is equally famous for the purity of its atmosphere. The air is said to be clearer and the sky bluer than anywhere else. Being surrounded by deserts, every breeze that reaches Arequipa is sapped of moisture. Nothing putrefies; decay is arrested in animate as well as inanimate life, so that everything dead dries up and blows away.

Arequipa has been celebrated, too, for several centuries as a seat of learning and a center of literary life. The most influential citizens are the monks. It has produced many famous ecclesiastical scholars and statesmen, and, although its university is not so much sought by students as it used to be, many young men are sent there from all parts of South America to be educated.

Another source of satisfaction is that the old Spanish families have kept their blood pure and can trace their pedigree back further, it is claimed, than those of any other part of South America. Therefore they are proud—very proud—and exclusive. But pure air and pure blood are about all they have to brag of, for in the preservation of their dignity and the contemplation of their virtues they have little time to devote to their other pursuits, and poverty prevails to a most painful degree among some of the oldest and most aristocratic families. The women are beautiful; the men are reserved and austere. Progress and modern ideas are looked upon as an evidence of vulgarity, and the fact that Arequipa is so slow and old-fashioned is a matter of congratulation rather than regret.

Arequipa is the home of Señor Don Eduardo Lopez de Romana, the second civilian who has been president of Peru. A civil engineer by profession, he takes little interest in politics, which is a distinguishing characteristic in a country where politics has absorbed the attention of the people to a degree that has been seriously detrimental to its material interests. But what distinguishes Romana still more is that he did not seek the presidency—a fact absolutely unique in the history of the South American Republics.

Because of the arid climate and the absence of clouds, the city of

Arequipa was selected as the site of the astronomical and meteorological observatories of Harvard University. Observers are engaged in making a map of the heavens of the southern hemisphere, the elevation and the purity of the atmosphere enabling them to reach many stars that are not visible in other localities, while meteorological records of great scientific usefulness are made by automatic instruments on the top of the volcano Misti.

Passenger trains leave Arequipa for Lake Titicaca on Thursdays and Sundays at seven o'clock in the morning. Freight trains run every day. The track climbs around the base of the volcano Misti. The mountains are bare and seem to be composed of alternate layers of rock and baked clay. The latter looks like chalk and cuts like cheese. It was very convenient and useful for grading purposes, and on the mountain sides are great cavities, which were shoveled out for this purpose, whose walls are as regular and as smooth as if they had been done with a carving-knife. At intervals of a few miles are lovely valleys, showing where the water has been gathered and utilized for irrigation, for the soil is rich and produces in a most prolific manner anything that man can plant. Sugar cane and wheat grow side by side, cotton and corn intermingle their foliage, and potatoes and melons and ordinary vegetables and fruits grow as they do in California.

We cross the grand divide at Crucero Alto (The High Cross), a collection of adobe huts and a well-built station, upon the front of which is an inscription to inform the traveler that it is the highest point upon the railway and 14,666 feet above the sea. There are mining settlements in Peru at a greater elevation, but for many years this was the highest point in the world at which steam was used for motive power. The highest elevation ever reached by a railway is Galera tunnel, on the Oraya road of Peru, 15,665 feet. The inhabitants are mostly railway men, it being the end of a division, and the families of the shepherds who watch their flocks upon the pampas that surround it.

At Crucero Alto water freezes every night of the year, and the thermometer often falls to 6, 8, and 10 degrees below zero. There are no facilities for artificial heat, not even fireplaces, and people keep themselves warm by putting on ponchos and other extra wraps. At noonday the sun is intensely hot, because of the elevation and rarity of the atmosphere, and blisters the flesh of those who are not accustomed to it. There is a difference of 20 and sometimes 30

degrees in the temperature of the shade and the sunshine. Water will freeze in the shade, while in the sunshine twenty feet away men may be working in their shirt-sleeves.

The natives seem to be entirely inured to cold, and go about barefooted and barelegged over the ice and stones, and have a way of heaping blankets on their heads and wrapping up their faces to keep the pure air out of their throats and nostrils. The women who herd the flocks are often out on the mountains for weeks at a time without a shelter or anything to eat except parched corn, strips of dried meat, and cocoa leaves, which are the most powerful of nerve stimulants.

THE MOST INFLUENTIAL CITIZEN OF AREQUIPA

From Crucero Alto, the highest town in the world, the southern railroad of Peru drops into the Lagunillas, the lake region of the Cordillera, where, 14,250 feet above the sea, is a group of large lakes of very cold pure water, without inlet or outlet, that receive the drainage of a large area and conceal it somewhere, but there is no visible means of its escape. A fringe of ice forms around the edges of the lake every night the year round.

A curious phenomenon about the lakes is that they keep the same level all the time, regardless of the dry and rainy seasons. No amount of rain will make any difference in their depth, which, however, in the center is unknown; and this adds to the awe and mystery with which they are regarded by the Indians. There are no boats upon the lakes except a few small balsas or rafts made of bundles of straw, which keep very close to the shore for fear of being drawn into whirlpools that are said to exist in the center. There is some foundation for this fear, for only two or three years ago a balsa containing five men disappeared in the darkness and was never heard of again.

In the whirlpool near the center of Lake Popo, which receives the waters of Lake Titicaca, hundreds of men have lost their lives. Boats that are drawn into the current are whirled swiftly around a few times and then disappear. For the protection of navigators the government of Bolivia has anchored a lot of buoys in Lake Popo, and boatmen who observe them are in no danger.

There is supposed to be an underground outlet from all of these lakes into the ocean. Articles which have been thrown into their waters have afterward been picked up on the seacoast near Arica, and on the beach in that locality are frequently found cornstalks, reeds, and other debris which do not grow on the coast, but are found in great abundance among the interior lakes.

After crossing the grand divide at Crucero Alto, you enter the great basin that lies between the two ranges of the Andes, and is known to the natives as Puna, 500 miles in length and from 20 to 300 miles in width. Before the conquest it was the most populous and productive part of Peru and the center of the great Inca empire. On either side this mighty table-land is supported by the buttresses of the Andes and the Cordillera, and the ranges of snow-covered peaks can be seen to the east and to the west from every eminence, a vast chaos of mountains, ranges, and cross-ranges, bleak, barren, and lifeless.

In no part of the world does nature assume more imposing forms or offer more striking contrasts. The deserts and the mountains are as bare and repulsive as the Sahara, but the valleys are as luxuriant and productive as those of Italy. Eternal summer sits side by side with everlasting winter, and the perfume of flowers and fruits is borne across repulsive wastes of sand and rock. Under these conditions the Incas maintained a government, the first known to the world in which the equal rights of every human being were recognized; a community that anticipated the ideas of modern socialism; that worshipped a god whose instincts and attributes were almost parallel with those of Jehovah. Men who have shivered in the snowy mountains recognized the sun as the source of heat and light, the greatest blessing they enjoyed, and gave it the chief place in their pantheon.

The railway through the mountains of Peru is said to be the best in South America. It has a fine track, quite as smooth as any we find in the United States. Most of the freight is furnished by the mines—silver, copper, and gold ores. A considerable quantity of wool is exported; also a few hides. The inward freight is merchandise for Bolivia and Cuzco, and supplies for the mines. The greater part of

TRANSPORTATION FACILITIES OF INTERIOR PERU

it appears to have come from Germany, and it is remarkable how rapidly the Germans are absorbing the commerce of this country.

There are fine cattle on all the ranges, much better than on the lower altitudes, and as the train approaches the center of the basin the population seems to increase and appears more prosperous, until we come to Juliaca, where the railroad divides, one branch running to the city of Puna, Lake Titicaca, where a line of steamers furnishes transportation to Bolivia, and the other to the ancient town of Cuzco, the capital of the Inca empire.

Four hundred years ago Cuzco was the most important city in America, with a population of 200,000 or more and a wealth that few communities of human kind have ever surpassed. It is now a dismal, dirty, half-deserted habitation of from 30,000 to 40,000 ignorant and indolent Indians, with perhaps 500 or 600 whites, who own the property and conduct what little business is done there. Cuzco was the residence of a long line of kings, who lived in splendid circumstances, surrounded by courts of enormous riches, and remarkable taste for art and architecture, considering the isolation in which they lived and their ignorance of other nations beyond the mountains and ocean that confined them.

Each successive Inca built a new palace at Cuzco, and several erected temples and convents that rivaled the royal residences in extent and magnificence. It is almost impossible to believe the narratives of writers who went there with Pizarro and witnessed the city before it was plundered and destroyed; but the ruins are mute witnesses of its former opulence and power. The means of grace are abundant—for a population of less than 40,000 there are 30 churches and 11 convents and monasteries, which are marvels of architectural beauty. The courts and cloisters of the convents are admirable in their proportions and challenge admiration with the great cathedrals and monasteries of Europe. In La Mercede lie the remains of Juan and Gonzalvo Pizarro, the brothers of the conqueror of Peru, and those of Almagro, his partner in the conquest. These temples were more splendid in their day than anything that existed in the new world, but are now the crumbling victims of time and negligence.

[*To be concluded in the July number.*]

THE COLONIAL EXPANSION OF FRANCE

By Professor Jean C. Bracq,

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It was not till the end of the fifteenth and the beginning of the sixteenth century that France attained anything corresponding to her present extent on the European continent and began seriously her extraterritorial expansion. The establishments made by French traders upon the Gold Coast and the Ivory Coast, in the fourteenth century, and the conquest and conversion of the people of the Canary Islands, in 1402, by Jean de Bethencourt, had foreshadowed what was to come. But the beginning of real expansion rose upon the west coast of France. Basque and Breton fishermen went early to the distant north, to Iceland and Labrador. It is probable that they visited Newfoundland before Cabot, for they fished there at an earlier period than the English. Later following the examples of the kings of Spain and England, the King of France became interested in the exploration of the new world. Verrazano, in the service of France, visited the Atlantic Coast of North America in 1523, and eleven years later Jacques Cartier, ascending the St Lawrence, opened boundless possibilities of expansion for France in the new world.

MOTIVES ANIMATING THE FIRST FRENCH COLONIES

Religious considerations predominated over secular ones in many ventures made at this time. In view of the precarious situation of Protestants, Admiral Coligny wished to establish on the American Continent colonies which, in case of need, would be possible places of refuge for French religious dissenters. Sixty-five years before the sailing of the *Mayflower* he endeavored to found a colony in South America, and six years later one in Florida. The first failed because of the inexperience of the colonists, and the second was destroyed by the Spaniards because of its Protestant character.

There are many who are fond of explaining most of the determinations of French history by racial factors, and erroneous ones at that. It is well to remember that though the French are Latins by their language and by much of their culture, they are, like the British, predominantly Celto-Germanic in blood. They have an ethno-

graphical peculiarity which, in the past, has always fostered colonial enthusiasm. They do not easily isolate themselves from society. Solitude is not pleasant to them; they are too communicative for that. Their thought more naturally seeks outward expression than concentration. An almost irresistible impulse leads them to wish to impart to others the principles and ideas which they value for themselves. Touch them strongly with religious emotion and they become missionaries. Thus France has more Catholic missionaries than all the other Catholic countries taken together. One cannot speak too highly of their zeal, of their almost complete surrender of selfhood, of their devotion, which at times attains the purest forms of heroism.

Though chartered companies were at work, it was predominantly a religious motive which led to expansion in Canada. Quebec, ever a very religious city, was founded by Champlain, a very devout man. Montreal from the first was a center of missionary and philanthropic effort on behalf of the Indians. The missionaries and the *courreurs de bois* radiated in every direction, the former to win souls and the latter for the satisfaction of a restless spirit; together they won a new empire for France. The loftiest possible aims predominated in this movement. Their ideal, to unite the whole Indian population into a great Christian confederation, was in perfect keeping with Henry IV's dreams of universal peace.

Meanwhile, under Richelieu and Colbert, expansion was taking place in other directions, reaching Guiana, some islands of the West Indies, and Senegal and Réunion Island in the Indian Ocean. The westward advance of Nicolet was contemporaneous with the first possession of Madagascar. While La Salle was working toward the Mississippi, France was expanding in India. Now was her golden opportunity in North America; but many causes in no wise connected with the colonial capacities of the nation were at work to prevent her from making the best use of her opportunity.

REASONS OF THE FAILURE OF FRANCE TO RETAIN HER COLONIES IN AMERICA AND INDIA

Like other nations of the times, France had an inadequate appreciation of the economic value of colonies. To her North American possessions she preferred colonies yielding tropical produce and spices, like the West Indies. She did not care to encourage the production of articles common to Canada and to France. Then emigra-

tion upon any large scale was prevented by the fact that the people did not feel the penury of land as in some countries. Another national trait worked in the same direction. Love of order, which led France to impose rules upon religion, politics, art, and literature, brought needless restraints. There were no commercial, no municipal, and no provincial liberties. Love of consistency demanded the introduction of feudal institutions, some of which have survived to this day. The people, suffering at home from them, found no incentive to go to the colonies, where they would still be under the same restrictions. The intolerance of the clergy in Canada produced similar results. They opposed the advent of Protestants. The whole history of America would have been different had the Huguenots been allowed to settle in New France. Then, men like Laurens, Boudinot, Jay, Marion, De Lancey, De Peyster, De Pew, and thousands whose virtues and intelligence were so potent in building up the best life of this Republic, would have wielded their influence in Canada.

A fact of transcendent importance in determining the fortunes of the French colonies was the geographical position of France herself. Had she been an island her transatlantic history would have been different. She would have kept aloof from those numerous continental contentions into which at times she entered on account of the necessities of her position, but more often for futile motives and with disastrous results. However, the ultimate fact which shaped the fate of Canada was the mother country. The expansion of a country can go on satisfactorily only in so far as it is supported by a sound national life. The reign of Louis XIV was bound to be fatal to the colonies because of its abuses and disorders. Nothing could have saved finances at the mercy of a personal power surrounded by flatterers, courtesans, and mistresses. The ruin of the national finances entailed the ruin of the navy. No navy, no colonies. The resultant of these causes led naturally to the Treaty of Utrecht in 1713, the first important colonial collapse of France.

The reign of Louis XV did not alter for the better the working of causes which had proven so fatal. The results of the national life led to the Treaty of Paris in 1763, which involved the total surrender of Canada and the vast domain of India to England, and Louisiana to Spain—almost the whole colonial domain. The most intelligent part of the French population had a very inadequate sense of the loss. Argenson had already said that if he were the King of France

he would give all his colonies for a pin's head. Choiseul was glad to give Canada to England, because American colonies, delivered from the presence of the French, would revolt against their mother country. France is not now grateful to him for his practical joke, though it was against England. Voltaire refers to the whole Ohio basin as "a few acres of snow." Among other things, he expresses the very charitable wish "to see Canada at the bottom of the sea." The wise Montesquieu is not wiser. "Kings," he says, "should not dream of populating great countries by colonies. . . . The ordinary effect of colonies is to weaken the country whence they are drawn without populating those to which they are sent." Economists insisted that the process was ruinous. Philosophers and philanthropists objected to colonies because of the presence of slaves in most of them. So indifferent was the French government that, before signing an alliance with the American colonists, it made a formal renunciation of its North American possessions, and in the sweeping arraignments of the *Ancien Régime* not one refers to the loss of a vast colonial empire.

To this blind indifference to transatlantic colonies there were some exceptions. Many Frenchmen realized the importance of the Newfoundland fisheries, and France clung tenaciously to them. Notwithstanding the clearness of French rights, Englishmen did their utmost, on the morrow of the Treaty of Paris, to deprive Frenchmen of their privileges. This intensified in the French heart the bitterness felt against an enemy which, however admirable in some respects, had never displayed any generosity in victory and seldom any fidelity to its treaties. The hypothetical explanation by Professor Seeley of the wars between England and France during 100 years as a competition for the new world is one of those fascinating generalizations of historians which, on the French side at least, has but a slender support. Frenchmen, in all the wars of the Revolution and of the Empire, seldom thought that they were contending for a vast empire. In their eyes it did not appear worth the powder burned. How could the Revolutionists, busy at home with a program of reforms never attempted at one time by any nation, contending against local uprisings and against united Europe, think of the colonies that they had lost? Although they defended the colonies that were left to them, the solution of the problem of freedom upon the continent reacted in some colonies. When the Revolutionists decreed the abolition of slavery the San Domingo Royalists signed a treaty with England that they might keep

their slaves. As to Napoleon, Europe was the field of his ambition. If he thought of India, it was that he might strike his enemy at her most vulnerable point. Had he cherished the designs ascribed to him by Seeley, he would never have sold Louisiana to the United States. His wars left France diminished, not only in Europe, but also in other parts of the world. The strategic position of the Indian Ocean, the island of Mauritius, was ceded to England, and with it, through the astute governor of that island, was raised the problem of Madagascar.

THE BEGINNINGS OF THE NEWER EXPANSION IN AFRICA AND ASIA

The Restoration was timid in its defense of French colonial rights. Its power, restored by foreign bayonets, was so unsteady at home that it could do little abroad and cared to do but little; yet it was this same Bourbon government that inaugurated the newer expansion, which was destined to better fortune. This expansion, unlike that of England, was not the result of a well-concerted design, but of imperative necessity. The Algerians, unmindful of the lessons which they had received in 1815 from Admiral Decatur, and in 1817 from Lord Exmouth, were desolating the Mediterranean coasts, and especially the coasts of France. France reluctantly took Algiers. The Orleanists accepted the campaign in Algeria as a troublesome inheritance, and gallantly attempted its never-ending conquest. Here France faced some of the most fearless warriors of the world—men whose bravery was heightened by religious fanaticism. England has never found upon her path such an ethnic and religious barrier. Some public men, even as late as 1845, proposed to abandon the province to its own fate. This, fortunately, was not done; but, on the contrary, the French flag was planted upon French Kongo and Grand Bassam, in Africa, and upon important groups of the Polynesian islands.

During the Second Empire colonial interests did not receive the attention which they deserved. Colonial preëminence in distant lands demands the preëminence of colonial interests at home. Not art, not philosophy, not science, not social life, but colonial aims, should be first in the national thought. This was far from the case during the Second Empire. However, the pacification of Algeria was progressing and French rule was extending southward. Napoleon encouraged the enlargement of Senegal eastward and took possession of Obok, near the Red Sea; New Caledonia, in the Pacific, and Cochin China, in Asia.

The Third Republic marks a signal advance. To some, colonies seemed poor compensations, but nevertheless compensations for Alsace. The brightening of the situation in Algeria was an incentive for wider experiments. The consciousness of the growing inferiority of France in territorial extent as compared with the great powers of the world also encouraged the expansion idea. The objection that the stationary population of France is fatal to expansion is rather an argument for it. The birth-rate of Frenchmen has always been higher in the temperate colonies than at home. In Algeria it is 15 per thousand higher than in Vermont and 11 higher than in France. In Tunis it is double that of Vermont and 14 per thousand higher than in France. This, however, is not of much moment, inasmuch as most of the French territories cannot become the permanent home of Europeans.

COLONIES ESSENTIAL TO A GREAT POWER

Colonies, to many, have appeared necessary to progress, and their lack or their subordinate importance as leading to retrogression. "Colonization," says M. Paul Leroy-Beaulieu, "is for France a question of life and death." It means self-propagation and self-protection. In order not to be behind the great powers, she must share in that great movement of territorial enlargement which is a common trait of great nations.

Without the shedding of much blood, France established a protectorate over Tunis. Senegal became the starting point of a march eastward, continued until the French flag waved over Timbuktu, the mysterious city of Tennyson, "shadowing forth the unattainable." French Guinea, the Ivory Coast, Dahomey, and the French Kongo were extended eastward and northward until they met, and with the Sahara, Tunis, and Algeria formed a continuous whole from the Kongo River and the Ubangi to Algiers, practically the whole of northwestern Africa, with the exception of important territorial indentations on the coast held by different European powers and Morocco.

On the east side of Africa, France endeavored to regain Madagascar, whence she had been so cleverly expelled by Lord Farquhar. She succeeded in establishing a protectorate, and as the Hovas eluded its consequences in 1895, General Duchesne led a brave little army to the heights of Emyrna and seized the capital, Antananarivo. Diplomatic considerations led France to annex the island, though her intention was only to secure a real protectorate.

At the same period she advanced from Cochin China and Cambodia to Anam, Tonkin, and Laos. The whole Mekong Valley thus opened to her, and the territories to the east constitute what is now known as Indo-China. She is thus well situated for a work of penetration into China. Indo-China contains about 285,000 square miles, and is therefore larger than the South Atlantic States. This makes France an Asiatic as well as an African power.

Her colonies are seventeen times larger than her own European territory. Those of Africa are thirteen times her size. After making allowances for the worthlessness of a large part of these territories, there still remains an empire five or six times as extensive as France, with immense economic possibilities.

THE REACTION OF COLONIZATION ON FRENCH LIFE AND THOUGHT

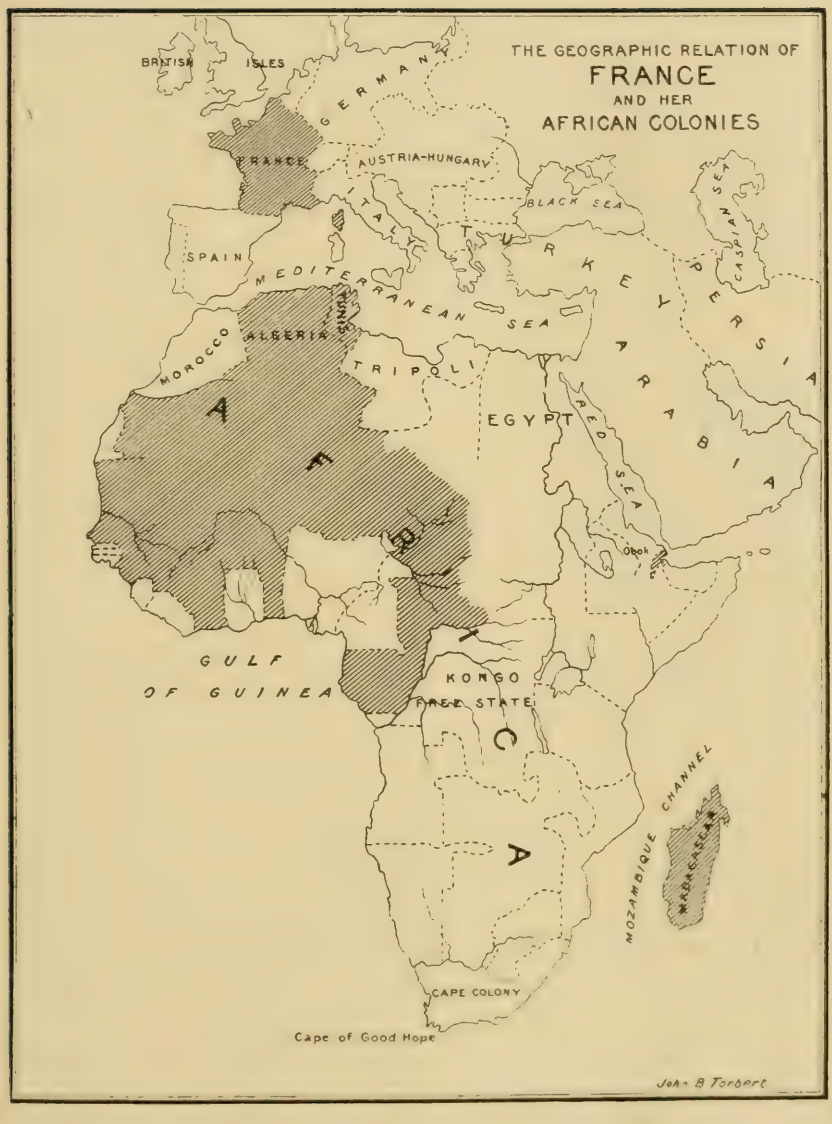
This expansion is not only the realization of a national purpose, but the outlet of a new life which has arisen during the Republic. Some have spoken of the unusual development of the army and navy, but this is only a part of a larger movement that has manifested itself by a corresponding educational, scientific, artistic, industrial, philosophical, ethical, and religious development. Even though appearances may be to the contrary, never has France seen such a display of national energy. The territorial expansion has called for the coöperation of every one of these forces and modified them. The army has witnessed its own transformation, not only by the introduction of new picturesque African and Asiatic elements, but by changing the soldier in the colonies into an overseer, a teacher, a gardener, a farmer, or a road-builder; it is modifying the national education. The contact with varied ethnographical types forces Frenchmen to reconsider their fundamental conception of man.

This movement, as well as the development of interest in the science of geography, contributed to a vast work of exploration. The list of French explorers during the Third Republic is as long as it is choice. Galiéni, De Brazza, Gentil, Mizan, Monteil, Binger, Fonté, and Marchand are names long to be remembered in France for their services, no less to their country than to the cause of knowledge. Science, enriched by enormous contributions to geography, botany, anthropology, and ethnography, is helping in return. Scientific literature relating to the colonies is accumulating. Colonial methods have become rationalized, as may be seen in Tunis, Madagascar, and Indo-China. Fearless and able historians are shedding

light upon past colonial errors. Artists are turning to new fields with enlarging results, and men of letters are beginning to paint the life of the new possessions.

At the same time an important change has been taking place in the French mind in reference to colonial life. With the telegraph and the newspaper, the Frenchman has no longer the aversion to colonization which he had in former days. Soldiers ask to remain in the colonies when their service is at an end. Many are happy in their new home beyond the sea. The *Comité Dupleix*, in Paris, works to increase their number. The government, with all its changes and inconsistencies, has had a definite program to consolidate the different parts of French North African possessions into one vast empire. Everywhere are springing up schemes for new railroads and for the use of watercourses. The railroads of Algeria and Tunis are extending. That between the Senegal and the Niger River is advancing. Among the schemes most strenuously advocated is the Trans-Saharan Railroad, which would take passengers from London and Paris to Lake Tchad in less than six days. With the recent conquest of Insala, this road is a colonial necessity. The gradual advance of France southward has changed all the conceptions previously entertained concerning Africa. So, too, there has been aroused an ambition for a Greater France, extending from Calais to the Kongo Free State—a France scarcely intercepted by the Mediterranean Sea, with Algiers not more distant in time from Paris than Omaha is from New York, and with Lake Tchad within as easy access as is the Pacific Coast from the same city. This view is not widely entertained, but it is rapidly gaining ground and the people are fast becoming colonialistic.

Let us now consider the positive, permanent results of French colonization. It is impossible to pass by the French colony of Canada. After 137 years of British rule, it is still French and unassimilated by its conquerors. In fact, the reverse in some places is true. There are names of Anglo-Saxon origin, such as Donaldson and MacGregor, borne by men who do not speak English. The French constitute an important factor in the destinies of Canada. Their bi-lingual education gives them a great advantage. There are those among them who hold high places in literature, some are eminent in the judiciary world, some are professors in the universities, and the prime minister is a French-Canadian. The population of Mauritius, not unlike that of Canada in character and condition, is still very strong in its French sympathies. It may be said that if the French of Mauritius remain


THE GEOGRAPHIC RELATION OF
FRANCE
AND HER
AFRICAN COLONIES
BRITISH ISLES
GERMANY
FRANCE
AUSTRIA-HUNGARY
ITALY
BLACK SEA
CASPIAN SEA
SPAIN
MEDITERRANEAN SEA
TURKEY
PERSIA
MOROCCO
ALGERIA
TRIPOLI
EGYPT
ARABIA
RED SEA
AFRICA
GULF OF GUINEA
KONGO FREE STATE
MOZAMBIQUE CHANNEL
MADAGASCAR
CAPE COLONY
Cape of Good Hope
Joan B Torbert

untouched by English institutions, those of Réunion seem to have been unaffected by the thought and life of contemporary France. The remnants of the old French possessions of India are not of much moment. St Pierre and Miquelon, near Newfoundland, generally known as St Pierre, are serving an important national purpose. They are the center of fisheries so extensive that at least 40,000 persons in France and in St Pierre depend upon them. They are also nurseries of well-trained seamen, indispensable to the French navy. It should be remembered that these colonies are but dislocated fragments of two vast colonial empires, and that their experiences prove nothing as to French colonial ability.

FRENCH COLONIES IN ASIA

Of the newer colonies, there are the Polynesian possessions, which, territorially, are not very important, but whose value will be greatly affected by the American trans-isthmian canal. The most promising is New Caledonia. It has the advantage, which so many French colonies lack, of being very rich in minerals, the extraction of which has proven very remunerative. Though a penal colony, it is attracting from France new elements, whereby the wealth of the island will be developed.

While making mistakes of policy and of judgment, France has achieved many beneficent results in Indo-China. She has introduced an order in the country which had never existed before; has organized the finances, and instituted regular budgets. That of Indo-China in 1898 had a surplus of nine million francs. She has introduced the *état-civil*, which is a great instrument of social security and social justice. She has established schools, model farms, important railroads, telegraphs, river navigation, quays, beautiful buildings, and extensive public works. Commerce has increased, and a study of the number of Frenchmen who have settled in this colony as compared with the Englishmen who have settled in India would be to the advantage of Indo-China.

MADAGASCAR, THE SAHARA, AND TUNIS

Africa seems to be the great sphere of French expansion. On the east side she has Obok, close to the southern entrance of the Red Sea. Its value is largely strategic. It has a good harbor, good water, and the territory is said to contain much coal.

Madagascar is one of the most hopeful colonies. The work of France here has been both destructive and constructive. She has overthrown the despotic Oriental government of the Hovas. The insurrection which followed was not so much the result of French conquest as the continuation of the movement of the *Fahanalos*, outlaws who for many years had been a very disturbing element. General Galiéni, in a most humane manner, restored order. The island is now more pacified than it ever was during the last ten years of the Hova government. The tribes are happy to have their own tribal chiefs and to be delivered from the former Hova governors, hated by all. Slavery has been abolished. State compulsory labor has been freed of its worst and more arbitrary features. The state church, with its official hypocrisy, has been disestablished. The schools, founded by the missionaries before the conquest, have gained in number and character. In the province of Emyrna, French Protestant missions have 800 schools; the Catholic, 700; the English and Norwegian missionaries, 250, and the government, 150. All fair-minded men must recognize that missionaries have never had a truer freedom nor a truer security in the island than now. France has constructed important public works. She has built roads from the capital to the coast on two sides of the island which previously was roadless. Now heavy trucks drawn by oxen take the place of men's backs in the transportation of goods from the coast to Antananarivo, the capital. This work will be done before long by a railroad. Telegraphic lines built by France extend in many directions. An extensive agricultural development is taking place, and a new life has dawned for that interesting island.

The field which is likely to undergo the greatest immediate changes is that immense possession south of the Sahara. With the exception of Senegal and other establishments upon the western littoral, the whole territory is as yet but very imperfectly organized. Vast districts have never been explored. Recent applications for concessions have been great. Three-quarters of the French Kongo have been leased by French companies, forty of which during the last year have here invested no less than $10,000,000. Whatever may be the economic future of this section of Africa, some positive results, which cannot but be approved by all, are already visible.

First, there has been an overthrow of the cruel African despots—black Caligulas—represented by Ahmadon, Behauzin, and Samory; second, the stopping of the slave trade, with its indescribable horrors; third, the great efforts made to bring back the natives to agriculture,

from which they have been driven by wars or slave trade; fourth, the rapid building of roads. One, 560 miles long, binds Timbuktu with Dahomey, and another of 500 miles forms the chord of an arc described by the bend of the Niger River. Miss Mary H. Kingsley, the remarkable English lady traveler and scientist, has testified to the beneficent influence of France upon that part of the Dark Continent. When the Senegal-Niger Railroad is finished and the Trans-Saharan built, under the blessings of *Pax Gallica*, a life never dreamed of will spring up in these territories.

Tunis is one of the most successful colonies of the world. The following facts concerning the work of France there are indisputable: First, she has introduced a security of life never known before; second, she has improved the finances; third, she has given a great impetus to agriculture and brought Tunis in touch with the markets of the world; fourth, she has greatly ameliorated the administration of justice; fifth, she has given a great impetus to education; in 1892 the budget for that purpose was between 160,000 and 180,000 francs; sixth, over 600 miles of railroad have been built. Roads have been constructed upon a large scale. In fact this has been one characteristic of the expansion of France in Madagascar, in Senegal, Algeria, and Tunis. With the recent stupendous development of the automobile and its introduction into the colonies, the building of these roads is of the greatest significance. Algeria is the most important achievement of France because of the internal development of that colony and its organic relations with continental France. Algiers, the former stronghold of African piracy, has become safer than London, and Algeria as safe as France. Though colonization in South Africa began in 1652, the Dutch and the British have not attracted thither many more than 700,000 Europeans. In 70 years France has drawn to North Africa 600,000 Europeans; and if she has had the advantage of nearness she has not had that of rich minerals, which are such demographic magnets. I have an absolute confidence not only in the power of Frenchmen to make the natives accept the present regime as the will of Allah, but in the ultimate reconciliation of both races. France has all along shown her genius to win to her men of other nations and races. The Navarrese united to France are most loyal, while those of Spain are still restless. Alsace, though ethnographically Germanic, longs to return to France. Corsica, though Italian, is attached to her Gallic conquerors. Savoy, after some 40 years of union, displays an unquestionable loyalty. In every French colony one sees signs of the growing attachment of the

natives. The English and the Dutch have perhaps secured more respect from the inferior races, but the French more love.

For a long time Algeria had as its governor the distinguished gentleman who now represents France so ably in the United States, M. Jules Cambon. To him more than to any other living man, French North Africa owes its encouraging advance. He has helped all to secure the best advantages from the juxtaposition of two forms of society and two civilizations, with their conflicting aspirations.

ECONOMIC ASPECTS OF FRENCH COLONIZATION

It is an extraordinary fact that with an energetic utilitarian foreign population, which, like all such aggregations, are impatient at any obstacle to their gains, the natives in Algeria should have kept to this day twelve-thirteenths of their soil. France has protected them with a real solicitude. They are ruled by Moslem law and by their own judges when they form homogeneous communities. They are gradually assimilating something of the western spirit, and this to an extent of which they are not conscious. The parts which are predominantly peopled by Europeans enjoy institutions almost identical with those of France. It is her policy to give her colonists the same institutional advantages which they would have enjoyed at home. St Pierre has all the administrative and educational machinery of the mother country. Catholics, Protestants, Hebrews, and Moslems in Algeria receive similar state support. The educational machinery of France has been extended there; efficient common schools, academies and colleges, schools of law, medicine, pharmacy, science, and *belles-lettres* have been established. Young women have a *lycée* in Oran, and able courses of secondary education are organized for them in several cities.

The economic condition is steadily improving. The railroads which at the outset were considered the wildest speculation are fast approaching the remunerative point. Rich deposits of phosphates have been discovered in southern Algeria and Tunis. It is almost certain that there are further south large quantities of nitrates. These may prove to be the gold mines of North Africa.

Algeria and Tunis not only furnish their own food and that of the French garrisons, but they have a large export account. In a fair year it amounts to 3 or 4 million quintals of wheat, 4 or 5 million hectoliters of wine, more than a million sheep, 60 or 80 thousand oxen, 100,000 quintals of wool, large quantities of tobacco, iron, zinc,

and lead ores. The neighborhood of Algiers is the winter garden of Paris, sending daily during the season steamers to Marseilles loaded with garden produce, which is distributed through France. More and more a twofold current of life binds Africa with France and France with Africa. French civilization moves southward with its imperfections, with the usual concomitants of such movements, but also with blessings unspeakable for the natives. It is not astonishing then that the north African colonies should excite a very legitimate enthusiasm among Frenchmen. M. Paul Leroy-Beaulieu says: "Algeria and Tunis are and will remain the first European colonies of Africa." The late Grant Allen has expressed the desire that in the interest of civilization the beneficent French power, as Hamerton puts it, might ultimately be permitted to extend over Morocco.

The natives under France have, as a whole, suffered less from their contact with European civilization than those under other great powers. Were Parkman still among us, he might repeat, concerning the lower races that come in touch with France, what he said of the Indian: "Spanish civilization crushed the Indian; English civilization scorned and neglected him; French civilization embraced and cherished him."

French expansion should not be judged by its economic results; yet even from that point of view it is gradually becoming more satisfactory. The trade of the colonies reaches $231,000,000, $160,000,000 of which is with France. Were she to allow her colonies to levy duties upon metropolitan goods, most of them would have a large surplus. But even though they are not self-supporting, neither are all the departments of France. The spirit of national solidarity which embraces poor departments must also prevail in the colonies; yet it must be admitted that the French colonies still cost far too much, and that 85,000,000 francs or $17,000,000 a year is excessive, though there are many signs that the regular demands upon the budget will soon decrease.

The colonial expansion of France has not only influenced for good the peoples whom it has reached and reacted favorably upon the French themselves, but it is also working for international enrichment. Temporarily her fiscal measures, at some particular points, may disturb certain old trading establishments of foreign houses, but the development of the new countries and the increase of wealth will counterbalance these obstacles, and the most intelligent producers will have the best economic possibilities, for after all these possibilities are "mightiest in the mightiest."

THE PREVENTION OF HAILSTORMS BY THE USE OF CANNON*

In 1896 the Honorable Albert Stiger, mayor of Windisch Feistritz, in Styria, revived an old custom of the preceding century, usually termed "weather firing." Formerly the firing was from ordinary mortars, but Mr Stiger introduced several modifications. He found that by the use of a funnel attached to the mortar the efficiency of the shot could be greatly increased. His machine was constructed on the following lines: A heavy block of oak or tough wood was hollowed out so that it could be fastened securely to the mortar by iron clamps, and an iron funnel was then screwed to the block of wood. The funnel is made of sheet iron 2 millimeters thick and has a diameter at the upper opening of 70 centimeters, while at the lower opening its width is only 20 millimeters. In 1897 as many as 36 of these firing stations were established.

At first Mr Stiger's experiments were sneered at and made the sport both of scientists and of the unscientific. But nevertheless the severity of the hail, which every year since the seventies had wrought great damage in Styria, ceased in Windisch Feistritz, while in the neighboring districts it became even more destructive. Gradually the belief in the efficacy of "weather shooting" as a protection from hail spread to the wine-growing districts in the vicinity of Styria. Here also the experiments proved a great success, and were then taken up by Lombardy, Piedmont, and the other provinces to the south. Then the Italian deputy, Dr E. Ottaviri, visited Windisch Feistritz and became also a convert to Stiger's system of weather shooting. He returned to Italy, and under his leadership similar apparatus, called Stiger cannon, were rapidly manufactured and set up, especially in Tuscany and Emilia; also an astonishing number of shooting associations sprang up, each with its individual station. In the summer of 1899, the first in which the cannon was used in Italy, no less than 2,000 stations were equipped on the Stiger pattern, and all were very active during the season. The Italians in fact became so enthusiastic that a congress was summoned and met November 6–8, 1899, in

*An abstract of an article from the *Wiener Abendpost*, by Dr J. M. Pernter, director of the Imperial Institute of Meteorology and Magnetism of Vienna.

Casale Monferato. At this congress the minister of agriculture was represented by the under secretary of state, and the ministries of war and the interior also sent delegates. Five hundred participants in the congress appeared, some of them the most distinguished scientists of Italy. Mr Stiger was elected honorary president, and a committee of four eminent professors, representing Styria, Piedmont, and Venice, were appointed to report on the results of the Stiger method for preventing damage from hail. The committee unanimously agreed that "if the shooting was commenced in time the damage from the hail was always averted." A number of instances were cited showing that in the towns where there was no shooting the destructive violence of the hail continued unabated, whereas in the districts where the shooting was done no hail occurred.

Mr Stiger, the inventor, however, particularly warns the public against being oversanguine, as he asserts that, in spite of the many successful results obtained by his process, there is not yet the certainty of its effectiveness.

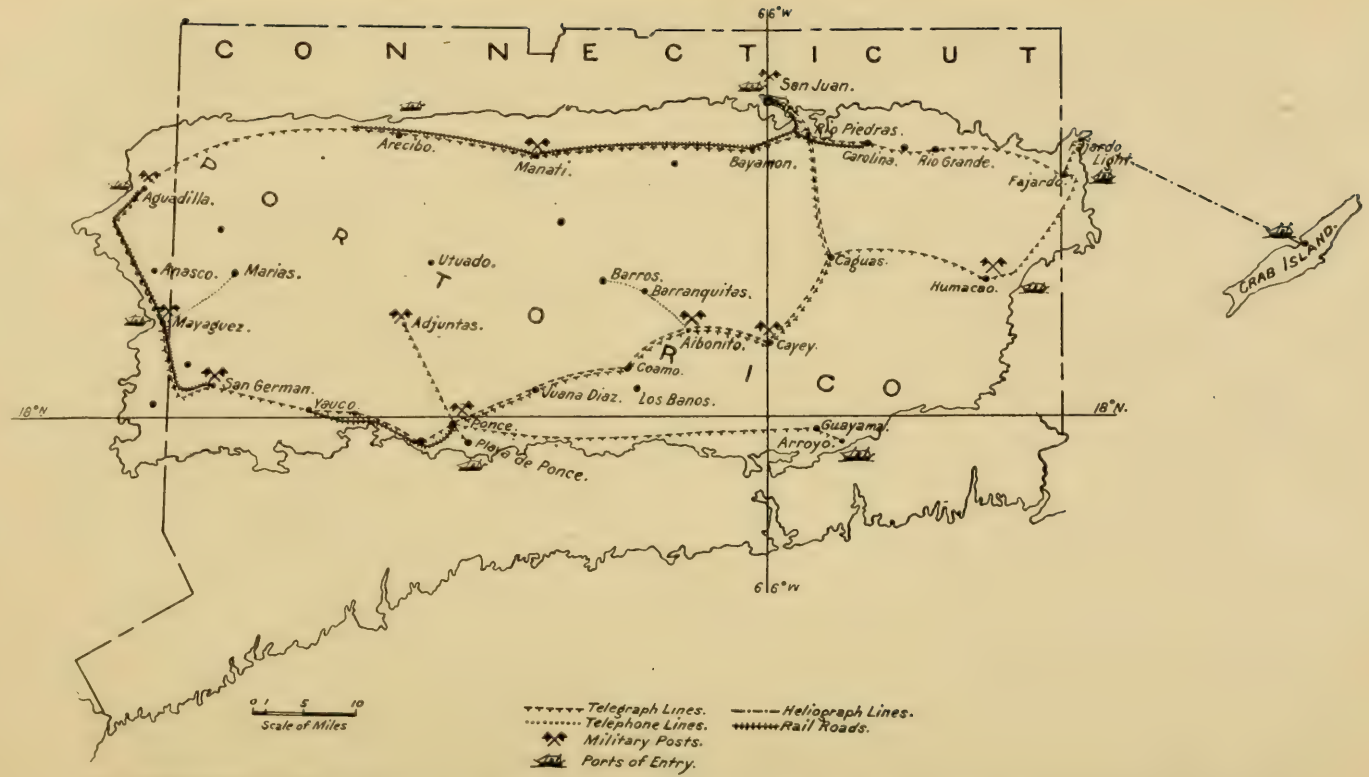
Every one is naturally asking the question, How can the formation of hail be influenced by "weather firing"? I confess that I am not able to answer, but I must assert that because we cannot comprehend the process we have not the right to deny its existence. In explaining the action of the cannon, two points are to be considered—the effect of the explosion and the force of the vortex ring that rises from the gun barrel. In the sultry, distressing calm that precedes violent storms it is almost a natural necessity to make a noise, and as loud a noise as possible. One feels that from the sultry calm before the storm misfortune is to come, and that by disturbing the stillness the misfortune may be turned away. Mr Stiger states that he was guided by this thought when he began his experiments in 1886. "The observation," he says, "that every hailstorm is preceded by an absolute stillness of the air, accompanied by heavy oppression, suggested to me the idea of disturbing this calm which seemed essential to the formation of hail, and therefore I tried 'weather shooting,' which has been known for centuries."

That vibrations can destroy the formation of hail has no foundation in physics. As far as our knowledge reaches, for we do not yet understand the hail-forming process, the explosion could not affect the process, either through changes in the clouds, or by the premature freezing of droplets through concussion, or through a considerable concussion.

We must therefore turn to the second hypothesis, that the effect of the vortex ring from the cannon prevents the formation of hailstones. Mr Stiger has from the beginning ascribed the successful results from his machine to the effects of the vortex rings. In an official report of an expert from the Imperial Institute, who was sent to investigate the experiments made by Mr Stiger in 1897, the following statement is made: "It was shown that by the discharge of a shot a vortex ring similar to the common smoke ring is produced and can be seen in reflected sunlight. The ring rises rapidly with a distinct whistling, which is audible at a great distance. Observations showed that this whistling could be heard for 13 seconds, and in calms for more than 20 seconds."

A swallow which was once struck by one of these vortex rings fell dead, such was its tremendous force. Mr Stiger estimates the effectiveness of the shots and the shooting apparatus from the duration of the whistling of the vortex ring. Step by step the size of the mortar, the depth and breadth of the bore, the form and height of the barrel, the weight of the powder, have been carefully determined by experiment, until a most effective combination has been attained. In some experiments, at which I was present, I saw the vortex ring shoot upward against the clouds like a shot from a gun barrel, and distinctly heard the whistling for 20 to 28 seconds. The astounding force of the vortex ring was best demonstrated by the horizontal shot. A series of peculiar targets were placed at distances of 40, 60, 80, and 100 meters. When the vortex ring struck the targets it threw down poles which were braced with heavy linen cloth, burst through paper targets in which the paper had a resistance of 12 kilograms, tore loose clamps, and broke one clamp which was 3 centimeters long and $1\frac{1}{2}$ centimeters broad. A large bulldog which was in the way of the vortex ring was tumbled over twice and lost all desire for further observation.

In this mechanical power of the vortex ring we have found the force which may possibly influence the process of hail formation. Unfortunately, as I have mentioned before, we know too little of the process of hail formation to be able to explain more clearly the action of the vortex ring, which certainly exerts a considerable force to a height of from 1,500 to 2,000 meters.



MAP SHOWING MILITARY TELEGRAPH LINES IN PORTO RICO OPERATED BY THE SIGNAL CORPS, U. S. ARMY, MILITARY POSTS, PORTS OF ENTRY, AND AREA COMPARED WITH THAT OF THE STATE OF CONNECTICUT

THE U. S. SIGNAL CORPS IN PORTO RICO

Through the courtesy of General A. W. Greely, Chief Signal Officer, U. S. Army, the NATIONAL GEOGRAPHIC MAGAZINE is enabled to publish the accompanying outline map of Porto Rico, prepared by Major W. A. Glassford, Signal Officer, Department of Porto Rico. This map shows existing railroads, ports of entry, and the telegraphic, telephonic, and heliographic systems of communication operated by the Signal Corps of the Army.

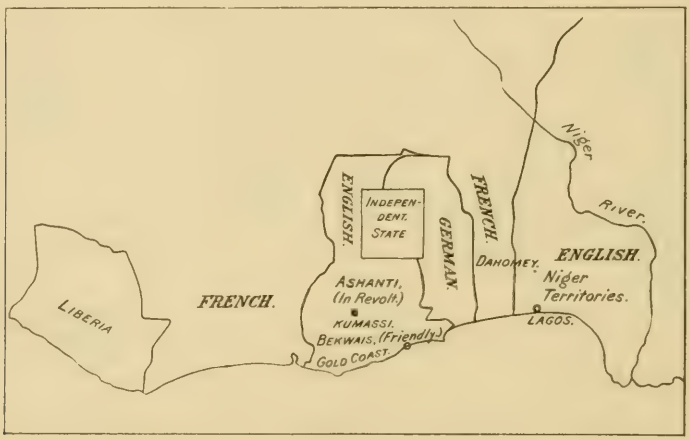
RUSSIAN RAILWAYS

The phenomenal growth of Russia in industry and trade during the last ten years is in large measure due to the gradual reorganization and rapid extension of her railway lines. Until 1889 the government was compelled yearly to meet a heavy loss on all railways which it had guaranteed, but gradually separate roads have been purchased, agreements have been made with a few larger companies, and new lines have been constructed by the government itself. As a result 60 per cent of Russian railways are now entirely in the hands of the state, and instead of showing a heavy deficit, yield a surplus. During 1899, 75,710,000 passengers were carried on Russian roads, which, with only a few gaps, run from the White to the Black Sea, and from the Baltic to the Yellow Sea. The rates of fare on Russian lines are the lowest in the world.

DR H. S. PRITCHETT, who will assume the presidency of the Massachusetts Institute of Technology in the fall, will be succeeded as Superintendent of the U. S. Coast and Geodetic Survey by Mr O. H. Tittmann. No man in the United States is better qualified by experience and ability than Mr Tittmann to be the head of this important scientific bureau. He entered the service in 1867, when a boy of seventeen, and has gradually won his way from the lowest to the highest grade.

During the last week of April the Ashantis in great force surrounded Kumassi and fiercely attacked the fort. Though they were beaten off with severe loss, they renewed the attack several times during May, and a general state of insurrection now prevails in the country.

Until 1894 Ashanti was a powerful confederation of tribes, which successfully withstood subjugation at the hands of the English from the Gold Coast Colony, though their capital was conquered and the kingdom much reduced in 1874. In 1895, when the confederation became weakened by the secession of a number of tribes, a permanent English garrison was stationed in Kumassi, and the kingdom came in fact within the English sphere of influence. Kumassi is about three miles in circumference, of an oval shape, and surrounded by an unhealthy swamp. The population probably does not exceed 20,000, of whom not more than 25 are Europeans. It is stated that the garrison of the fort, numbering 358, included only 18 Europeans, the rest being native allies, principally, from the Fanti tribes along the coast and Mohammedan Hausas, who have immigrated from the Niger districts of the interior.



Reinforcements are on the way from Sierra Leone and Lagos, but from the coast they have to march 180 miles, for the most part through a wilderness of swamp and virgin forest, before reaching Kumassi. The population of the Gold Coast Colony (this does not include the tribes of the Ashanti confederation) is estimated at about 1,500,000, and is friendly to British rule. They could not, however, render the English much effectual assistance against a determined revolt of the Ashanti tribes, as they are of a mild and inoffensive disposition. No estimate of the numbers of the Ashantis in rebellion can be formed, but the statement that they muster some 50,000 warriors is not improbable, and most of them are armed with old-fashioned percussion-cap guns.

Ashanti is famous for its gold and goldsmiths, and for skill in the weaving of cotton. The climate has the reputation of being the most deadly in the world for foreigners of every nationality.

GEOGRAPHIC MISCELLANEA

A BROCHURE containing every decision of the U. S. Board on Geographic Names is now in press and will soon be ready for distribution. The Board, which has recently been enlarged, consists of Henry Gannett, chairman; Marcus Baker, secretary; Andrew H. Allen, Otis T. Mason, H. G. Ogden, A. B. Johnson, Harry King, Major James L. Lusk, A. Von Haake, H. T. Brian, and John Hyde.

THE *Meteorological Chart of the Great Lakes*, which was last year issued monthly during the season of navigation by the U. S. Weather Bureau as an experiment, will hereafter be a permanent feature of the Weather Bureau work. The chart proved so serviceable in 1899 that it is now indispensable to vessels sailing between the Lake ports. It is edited by Prof. A. J. Henry and Mr Norman B. Conger, of Detroit, Mich.

FOR the first time in its history the actual sea-levels, mileage, latitudes and longitudes of the Mississippi River are being determined. The work is in the hands of the Mississippi River Commission, the board of army and civilian engineers charged with the duty of improving this vast watercourse. As years of experiment and more or less defined effort at improvement have not resulted in permanent good all along, the commission has wisely decided to survey the entire system and triangulate every foot of its course.

THE telegraph line begun five years ago to connect Victoria Nyanza with the east coast of Africa has been completed. One of the practical uses of the line will be to give warning to Lower Egypt of the state of the water on the Upper Nile, information that will in some cases be worth millions of dollars to the people of Lower Egypt, who depend on the river for their irrigation water. The railroad which is being built along the same route is now in operation to Kiu, about 270 miles inland. To complete the remaining 400 miles will require three years.

THE HAVOC that can be wrought by the hurricanes which periodically devastate the Greater, and especially the Lesser, Antilles will soon be reduced to a minimum, owing to the effective work of the U. S. Weather Bureau. Gradually meteorological stations are being established at all points on the Gulf of Mexico, the Caribbean Sea, and in the West Indies from which advance warnings can be cabled. The most recent of these stations is that at Turks Island, at the extreme southeastern end of the Bahamas, where Dr H. C. Frankenfield is now engaged in putting in the necessary apparatus.

THE concession by the Chinese Government allowing steamers of the river type to navigate the inland waters of the empire has proved worthless in fact. A dispatch to the London *Times* from Shanghai states that the Shanghai customs Taotai have refused to permit a British vessel to trade between that city and the Chusan Islands, only a few score miles distant from the mainland. This is only one of many similar refusals, with the result that nearly all the steamers that were specially built and sent to China for coastwise and interior trade either remain tied to their docks or have been sent back to England by their British owners.

Two prizes, the first of $150 and the second of $75, were offered in 1899 by the National Geographic Society for the best essays on Norse discoveries in America. The competition closed December 31, 1899. By the decision of the Board of Judges, consisting of Henry Gannett, Geographer of the U. S. Geological Survey; Albert Bushnell Hart, Professor of History in Harvard University; Dr Anita Newcomb McGee, Acting Assistant Surgeon, U. S. Army; John Bach McMaster, Professor of History in the University of Pennsylvania, and Dr Henry S. Pritchett, Superintendent of the U. S. Coast and Geodetic Survey, the first prize has been awarded to Charles B. Dalton, of New York City, and the second prize to Kenton Foster Murray, of Norfolk, Virginia.

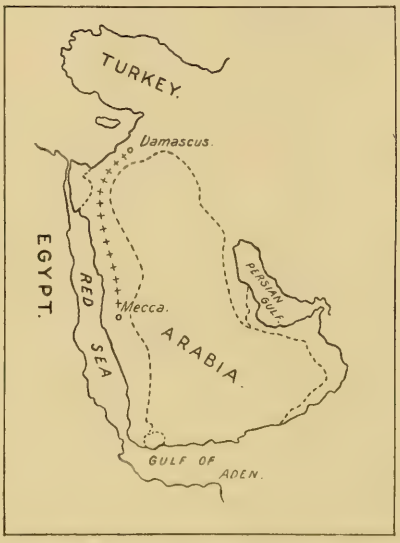
That the ant in the tropics is much more important as a geologic agent than the earthworm of temperate regions is maintained by J. C. Branner, Professor of Geology in Leland Stanford University. Professor Branner discovered new proof in favor of his theory during several months passed in Brazil in 1899, which he publishes in the last number of the *Journal of Geology*. In the city of Theophilo Ottoni the streets had been in many places cut down through rock which in places was decayed, and in some of the fresh cuts he saw holes made by ants penetrating the ground to a depth of ten, twelve, and even thirteen feet. Naturally the ants do not bore into the hard undecayed rocks, but the opening up of the ground by their long and ramifying underground passages hastens decay, and the working over of the soil contributes to the same end.

The gold-bearing area of Cape Nome and the copper fields in the vicinity of Copper River and Mt Wrangell, the most important field for exploration in Alaska at the present time, will be carefully surveyed by parties from the U. S. Geological Survey during the coming summer. The extent of the gold belt that passes through Cape Nome is unknown, but it is believed to cover an area of from 3,000 to 4,000 square miles, all of which needs to be mapped and prospected. Mr Alfred H. Brooks, geologist, who, in company with Mr F. C. Schrader, visited Cape Nome in 1899, and Mr E. C. Barnard, topographer, will direct the geologic and topographic parties at work in this territory, and hope to bring back a map of the gold area on the scale of four miles to the inch. Another party, led by Messrs W. J. Peters and T. C. Mendenhall, is to trace the extension of the gold belt to the northeastward and determine how far it penetrates into the interior of Alaska.

Two billion five hundred million dollars of German capital is invested in agricultural, industrial, and commercial enterprises beyond the seas; nor does this enormous sum include the foreign securities held by Germans. In Mexico German interests are estimated at $95,000,000; in Central America and the West Indies, $60,000,000 each; in the north of South America, $47,000,000; on the west coast of South America, $70,000,000; on the east coast, $140,000,000; in Persia, Arabia, and British India, $12,000,000; in southeast Asia, $60,000,000; in east Asia, $17,000,000. In North Africa Germans possess plantations and industrial works worth $2,500,000; in West Africa, $1,000,000; in Cape Colony, $9,000,000; in the Transvaal, $240,000,000; in Portuguese Africa, $5,000,000 In Turkey Germans have invested about $7,000,000 in landed property and $60,000,000 in industrial enterprises, mainly railways, not including $95,000,000 which the Bagdad–Busra Railway will cost. German interests in the United States and Canada are estimated at from $1,000,000,000 to $1,250,000,000.

The loss of life from lightning in the United States was greater in 1899 than in any other year for which statistics have been compiled. Prof. A. J. Henry, in the current number of the *Monthly Weather Review*, states that 562 persons were killed outright or suffered fatal injuries, and 820 persons received injuries varying from a slight shock to painful burns and temporary paralysis of some part of the body. In fatal cases death was usually instantaneous. The most common form of disability resulting from lightning stroke was a partial paralysis of arms and legs. The zone of danger from a stroke of lightning is apparently larger than the common belief, namely, that in a single discharge from cloud to earth or earth to cloud the zone of danger does not exceed a few inches. But several instances of death by a lightning bolt would seem to show that the influence of a single bolt is not so confined. Professor Henry cites an accident where a span of horses attached to a wagon and a man in the rear of the wagon were killed by a single bolt, while the driver in front was not seriously injured.

Mecca, the sacred city of the Mohammedan world, where for centuries no Christian has entered except by stealth, will soon hear the whistle of an American locomotive. A railway from Mecca to Damascus is now being surveyed by a commission of engineers appointed by the Sultan, and a railway battalion is to be specially created by the war office to take charge of the work of construction. The significance of the road is not so much in its commercial importance as in the revolution it means to Ottoman traditions, and in the fact that the Sultan has not been compelled by foreign powers to agree to the construction, but is himself its originator and promoter.



Two thousand five hundred miles of telegraph and cable lines are now in operation in the Philippines, every mile of which has been laid or reconstructed by the U. S. Signal Corps since the battle of Manila Bay, two years ago. Six thousand five hundred messages are flashed over these lines daily, all on government business, civil or military. Because of the vast volume of official business the lines cannot be used commercially, but such use is hoped for in a few months. Many of the lines have had to be rebuilt several times, as in the mountainous districts the insurgents cut them down when they raid the valleys. A network of wires covers Luzon, with only two gaps. One of these is strategically important, as it prevents the southern half of the island from communicating with Manila. The passes through which the line would pass are held by the insurgents. Panay, Negros, and Cebu also have the beginnings of a similar network, and the first cable in the system to connect all the islands has

been laid between Cebu and Leyte. The Signal Corps is making the connections by cable as short as possible, as the frequent earthquakes play havoc with submarine lines.

The grip of the bubonic plague on every continent has tightened. In San Francisco six deaths from the disease have occurred and the board of health has officially proclaimed its existence in the city. Effective quarantine of Chinatown and inoculation will probably prevent a further invasion of the United States. In India the difficulty of dealing with the disease has been greatly increased by a protest of the Mohammedan population in Bombay

THE EXTENT OF THE BUBONIC PLAGUE

By courtesy of the *New York Herald*

against the precautionary measures being taken by the Indian Government. At Manila, Philippine Islands; Osaka, Japan; Sydney, Melbourne, and Brisbane, Australia, and Auckland, New Zealand, many fatal cases have occurred. At each of these cities infected rats were found on the wharves. On the southeast coast of Africa, in Mauritius, at Suakin, on the Red Sea, at Cairo, at Port Said, at the northern end of the Suez Canal, and at Rio de Janeiro, Brazil, the disease is also planted.

From St Petersburg to Vladivostok by way of the Arctic Ocean is the plan of itinerary of an exploring party that early in June leaves the former city on the steamer *Aurora*. Six scientists and twelve sailors, all experienced in Arctic travel and led by Baron Toll, make up the party. Their special object is the careful exploration of the Arctic regions north of Siberia. After a brief stop at Tromsö, Norway, and at the new Russian port of Catherine Harbor, on the Lapland coast, they will proceed to the Taimur Peninsula, west of the Yenisei River, and there establish their winter headquarters. The neighboring territory is to be explored during the winter of 1900–'01. On the breaking up of the ice, about August, 1901, they plan to push on to Sannikoff Land, discovered by Baron Toll in 1886 and as yet unexplored, and later farther northward to Bennett and De Long Islands, following the routes of the *Jeannette* in 1881 and of the *Fram*. The winter of 1901–'02 will be devoted to determining whether this group of islands extends to the Pole. When the water route reopens in 1902 they will resume their voyage to Bering Strait and reach Vladivostok in the fall of the same year.

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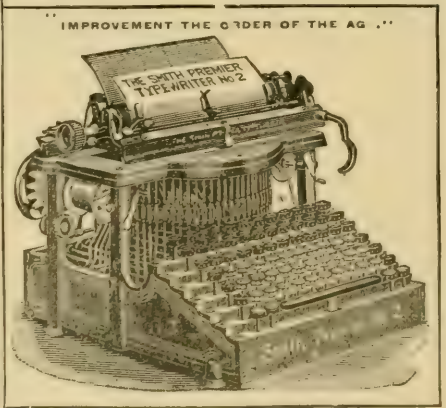

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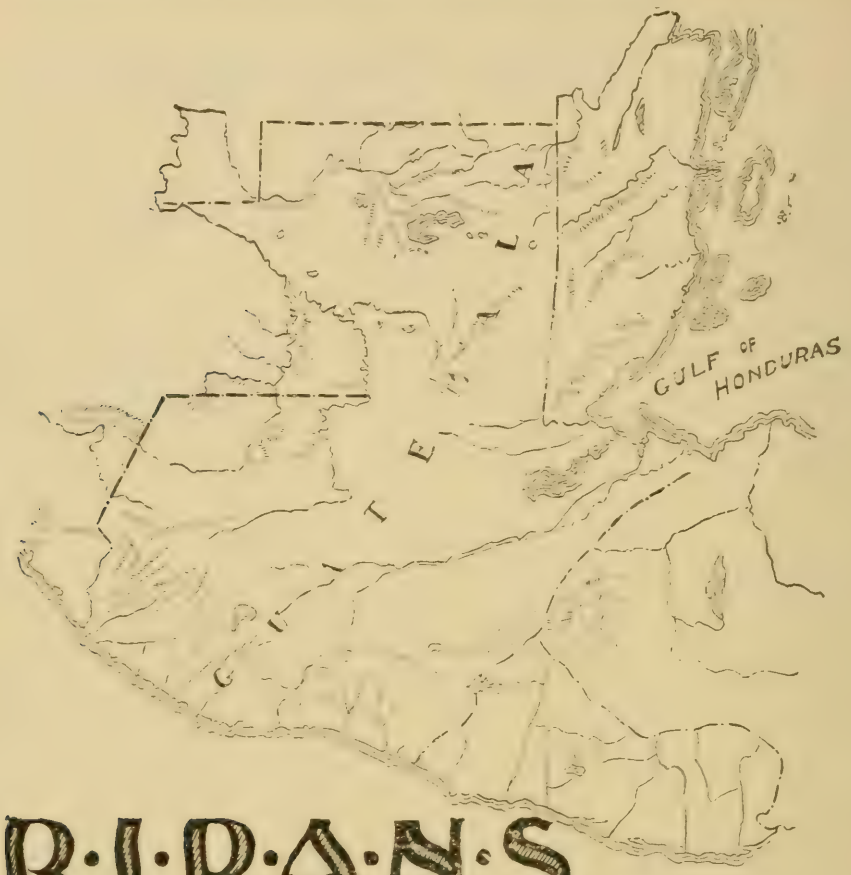

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THE

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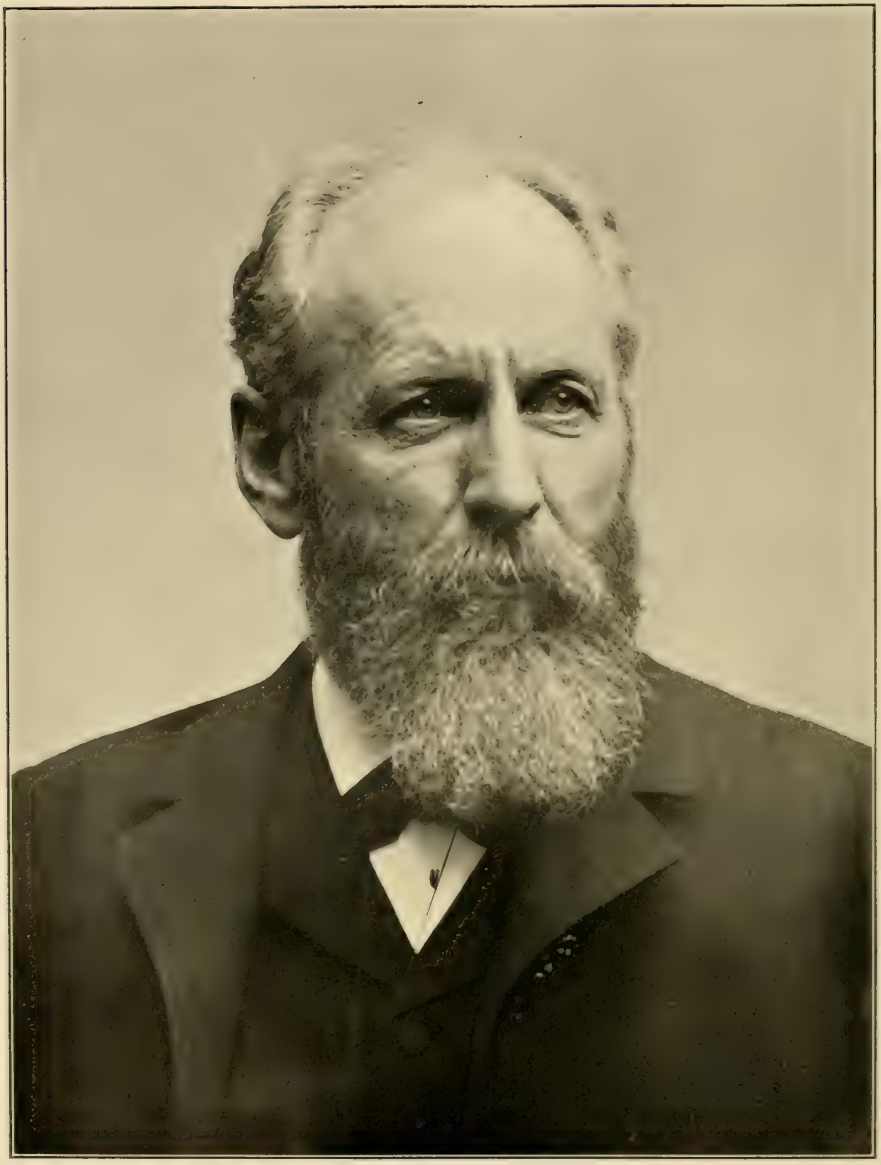

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THE

NATIONAL GEOGRAPHIC MAGAZINE

VOL. XI JULY, 1900 No. 7

THE EXPANSION OF ENGLAND

By EDWIN D. MEAD, LL.D.,

Editor of the New England Magazine

The name and fame of Sir Walter Raleigh are perpetuated in the name of the capital of one of our states—a state which I wish bore the name of Roanoke instead of North Carolina, that a double historical lesson might be taught. I wish that there might stand in the center of the city of Raleigh, which perpetuates this historic name, a worthy monument to the great movement for the English colonization of America. The central figure of that monument would be Sir Walter Raleigh. At Worms, on the banks of the Rhine, where Luther made his great protest against the Empire and the Church, is that greatest and most distinguished of all monuments, as it seems to me. The figure of the great reformer is surrounded by the forms of Wyclif, Savonarola, Huss, Melancthon, the Elector, and the various men who, in the political and intellectual advances of the time, and the preceding time, were coöperators with him in that great movement which we call the Reformation; so I wish that this great movement for the colonization of the New World by our English race, one of the most momentous chapters in history, might have a similar commemoration. Surrounding the central figure of Sir Walter Raleigh should be Drake, Hawkins, Frobisher, Davis, Capt. John Smith, Bartholomew Gosnold, and dear Richard Hakluyt.

In that notable time there is no figure so romantic as his. There was no other mind so generous and so capable, of so great comprehension and scope, as his, concerning the opening of this New World. He it was who, in the pressure and the dangers of that time, most clearly discerned that it was from America that Spain derived so

much of her wealth and power. He became inspired by the desire that England should have a foothold here, and that she should supplant Spain in the New World; and at last, after the failure of all the colonies which he sent out, one following another, to occupy new ground here—at the last, toward the close of life, the great prophet and believer said, "America will yet become an English nation." All honor to the prophet!

When we study the expansion of England we should remember that that work in its beginning was a chapter in the history of America.

THE FIRST EXPANSIONISTS—HAWKINS, DRAKE, AND FROBISHER

It was not until 1584 that Raleigh established his first colony at Roanoke, and just before that the activities of that adventurous set of men began who conferred so much glory on the age of Elizabeth. A score of years before, when Elizabeth became Queen, the fortunes of England were never at so low an ebb. For five centuries before that England had claimed portions of France, and her kings and queens had been crowned kings and queens of France as well as of England. It was at that very time that England lost her last hold upon the continent, and the England which Elizabeth came to rule was the smallest England in history for centuries, yet it was the period that began with her reign which was the most glorious in the history of England.

In a certain sense, the expansion of England—at any rate, of English thought of the world—had its beginnings with Alfred the Great. Alfred loved geography, and his mind went out from the little island which he ruled to the great world outside. The few writings of Alfred are most interesting; his books adorn the libraries still, and the most interesting chapters of them all are on geography. He was the first influential Englishman who had what we may call a geographic imagination; but he did little for the expansion of England. It was the Elizabethan age that began that work, and it began in ways that seem a little queer to us with our somewhat different notions of political morality.

Sir John Hawkins was one of the first English adventurers who sailed the sea to some purpose for Elizabeth. It is a familiar story how he sailed out from Plymouth with ships named "John the Baptist" and other pious names to carry slaves from the east coast of Africa to the West Indies and compel the Spaniards to buy them of him at the cannon's mouth, for there was a law in Spain that her

colonies should buy slaves only from Spanish ships. Sir John Hawkins would have none of this, and her colonists bought them at the cannon's mouth. While they were on this business these pious people seem to have had little idea what sort of business it was. The chaplain of one of the ships on that slave business thanks God for sending a calm to "save his elect" from the waves in a storm. He prays Him not to let his elect suffer; and so, he says, there was a great calm.

The boldest and most ambitious of these adventurers was Sir Francis Drake, sailing out from Plymouth for the circumnavigation of the world. He had sailed on daring voyages before that. I think there are few scenes in that Elizabethan time more interesting than that of Francis Drake climbing to the top of a tree on the Panama mountains from which he could look east to one ocean and west to another, with heart full of longings to sail those Pacific seas. One thrills at the thought of his sailing in his few ships, scarcely larger than our little coasters, pushing through Magellan Strait, along the west coast of the continent, and over the Pacific to the Philippines and other places which the history of these last two years has made so familiar to our own students of geography. Occasionally, when he had a chance to put in a fight with a Spanish ship, he "annexed" goods; and finally, after all his incredible adventures, he got back to Plymouth. It is a great story.

We might follow Davis and Frobisher in their efforts to push up to Greenland and through to India by the northwest passage, for that is one of the most interesting moments in this early history of English expansion. But little came of it. There is a certain poetic fitness in Drake and Hawkins sailing together and both finding their deaths in the West Indies—one at Porto Bello and the other at Porto Rico—where the English rivalry with Spain had been so long and violent.

What was the result of all these adventurous sailings of the sea? At the end of the reign of Elizabeth not one inch of settled territory in the New World remained in the possession of England. But this was accomplished by it: These wonderful dare-devil adventures of Hawkins and Drake and the rest were great training experiences whereby Drake, Hawkins, and the rest were fitted to face Spain, and to face Spain successfully, by and by, when the Armada came, and to crush that power forever as the great foe of liberty in the north of Europe. That the English came out of that conflict as conquerors was due to the fact that by all these adventures, many of them so questionable, they had been trained, and that their navy had been

built up to a degree commensurate with the responsibility they had to face.

THE BEGINNING OF THE DEFINITE EXPANSION OF ENGLAND WAS THE DEFINITE EXPANSION OF AMERICA

It was not until 1606, the Roanoke colonies having been failures, that the definite expansion of England, which was the definite expansion of America, began in the first Virginia charter. It is an interesting thing, however, going back through the century before, when, one after another, five or six nations, in one way or another, were struggling for this New World—Portugal and Spain having it all divided between them at one time—to find that there breaks, little noticed, into the midst of the commotion of all these powers one little English squadron. In 1497, on the coast of Newfoundland, we find John Cabot, sailing out under English auspices and under English orders. As one of our historians has well said, the appearance, in the midst of all the noise and ambition, of the little English fleet, just for a moment, was like one of the musical *motifs* suddenly appearing in the midst of one of the dramas of Wagner. By and by with its reappearance we see that its first appearance was a prophecy of what was to come, and by and by again it grows and becomes the dominant note, controlling all the rest. So it is that the appearance for a moment, in the midst of the squadrons of Spain and Portugal, of that little English fleet was a new *motif*. It was a prophecy of the time when that English *motif* should be dominant and England should be the controlling power upon this continent.

The great men of England, the rulers of England, thought little of the events from which have sprung such great results. In our own time our American poet has written, in his essay upon "*New England Two Centuries Ago*," of the little company who came out of England and landed at Plymouth, that they were destined to influence, beyond any others, the future of the world. That in truth was to be the work of the Puritan. Not a man of high place at the beginning of that seventeenth century realized the significance of that coming. It was an event destined to shape human history, to alter the whole course of affairs in the world; yet I suppose few things at that time happening in England attracted less attention.

On the last day of the sixteenth century, December 31, 1600, something else happened, of a very different kind. On that day Elizabeth set her name to the charter of the East India Company. Those who

are familiar with the many efforts in the years before that to push English trade into the East remember of the founding of the Muscovy Company in 1555 and the amazing stories told by adventurous Englishmen who pushed through Russia and Persia and so found a way to the East. From papers which Sir Francis Drake captured from Spanish ships, he learned for England the methods of a different trading system with India; but it was not until that last day of the century that the East India Company was actually founded. Some may remember the story of the first little fleet. In Malakka Strait the three or four ships fell in with a great Portuguese ship and fight was at once opened. It was the habit in that day to open fight with almost any ship that had plunder. It was in 1601, almost a score of years before Bradford, Brewster, and Carver sailed from Plymouth near by, that this first East India Company's fleet sailed from Tor Bay—the place, it is worth remembering, where, in 1688, a king was to land in England from Holland to supplant the last of the race of Stuarts. We see the beginning, in that little piece of piracy, as we should call it, in Malakka Strait, of the East India Company's work.

THE TWO CONTRADICTORY ELEMENTS OF ENGLISH EXPANSION—THE SPIRIT OF LAWLESS ADVENTURE AND PIRACY AND THE LOVE OF FREEDOM

In these two instances—in the silent, unobserved coming of the men of Plymouth, an event calculated, as our poet has truly said, to work a revolution hardly second to that wrought by the men who went up out of Egypt, and in the piracy of the East India Company—we have an illustration of the two forces and qualities which we have to keep in mind as we survey the great work of English expansion, the growth of the English empire in the world. A great race, indeed, is this English race—the best race in the world, it seems to me—but a race whose blood has ofttimes been altogether too red, and which, in the great fight for freedom, has itself always had to fight with the bad elements in its midst—those elements so inconsiderate of the rights of other men, which have so often brought disgrace upon the English race and which every one of us should always remember with shame and with misgivings and apprehension. These two strains we find running side by side in all this great history. We find in the era of colonization the spirit of lawless adventure and piracy running side by side with the love of freedom and the devotion to godliness. Our poet has said again of the Puritan colonists, the men who came to

Plymouth and Boston and Hartford, that they were "the first colonists in history who went out not to seek gold, but God." We shall find, as we study English colonization, that it is always the former of these elements, the gold-seeker, that has started the fighting, and that the freebooting colony has by and by come to grief, sowing the seeds of quarrels from which they reaped such a tragical harvest for England and for the world.

With this epoch of colonization England became more than the people of the little island—England became a world people; and we in America remember that it is as she has become what she is that we have become at all; and as we come back to this seventeenth century, which was the great century of the expansion of English freedom—the century in which Englishmen declined to allow that an English king could rule by divine right, but decreed that he was "as much a creature of law as the pettiest tax-gatherer in the realm"—it is important to remember that the great Puritan movement which accomplished this was a movement on both sides of the Atlantic. It brought in the Commonwealth in England, and Oliver Cromwell and Sir Harry Vane worked for the same things for which our fathers were working here—for the true expansion of England. Freedom was worked out in America and England alike; each side reinforced the other. It was precisely at that time of the Commonwealth that English power was felt as it had never been felt before in the affairs of Europe. If there was wrong—sufficient wrong—the power of Oliver Cromwell would be felt in Italy, in France, and among the Alps, as well as in England itself. The English navy took its definite shape and became a power in the world during the Commonwealth.

THE EXPANSION OF ENGLAND IN AMERICA IN THE EIGHTEENTH CENTURY A MATTER OF CHANCE AND NOT OF FORESIGHT

We have been reading, the last fifteen years, the brilliant work by Professor Seeley, who was one of the most learned professors in Cambridge twenty-five years ago, when I had the good fortune to be there, and who possessed one of the most comprehensive and acute minds which have dealt with modern history. His book upon the expansion of England has almost given us a new definition of English history in the eighteenth century and since. The main thesis of his book is that as the seventeenth century had been the century which expanded and upheld English freedom, the eighteenth century marked the era of English expansion and empire; that the wars of the eigh-

teenth century, which otherwise perplex us, were really waged to plant English power permanently in America and other lands; that they were not waged primarily for continental purposes, but were waged for America and for the expansion of England.

I think that Professor Seeley, with his vivid imagination, goes a little too far in that book. He is in danger of ascribing to England that which England only blundered into. He does not bring out adequately, what I think the historical scholar must in the end declare, that the wars in the eighteenth century—the wars which we have named after King William, Queen Anne, and King George—were not waged for America and the expansion of England. England struck here and France struck here because it was a convenient way in which to strike for home purposes. As a matter of fact, all these colonial enterprises served for the expansion of England, and Englishmen were carrying them out; but the significance of America was something hard to grasp by England as a nation. As we study that century the thing that impresses us is the indifference of England to these colonies—the failure to apprehend what America meant and what the possibilities of English expansion were.

The one man of that eighteenth century who understood in some measure the meaning of that word America was William Pitt, the Earl of Chatham. When he first said, in 1755, concerning the Seven Years' War, that it was being waged in behalf of the despised and neglected colonies, he said something that few men in England could even understand. I have stated that I should like to see rise in the city of Raleigh a monument to English colonization. We also need a monument to William Pitt, the first great Englishman to realize what America was to be. We have, indeed, named one of our cities after him, and it has become a great city. Never was a city more fortunately named than Pittsburg, standing on the site chosen by Washington himself as a key to the situation in the struggle in the West in that great campaign of England for North America.

As we go on to the next century, the most eventful year is 1759, the year of the capture of Quebec by Wolfe. That event was significant because it settled finally that England, and not France, should control this continent. When, on the evening of that September day, under the stars, Wolfe and his gallant men climbed the banks that led to the heights of Quebec—on that September night the great West, the Mississippi Valley, dotted with its forts and garrisons, was in the possession of France. That great country from Nova Scotia to the

Mississippi passed, as a result of the battle of Quebec, from the possession of France to that of England. New France on the morning of that day was a thing of the past. New England was simply a little strip along the shore. It was a great day—more significant even than the day of the Declaration of Independence—because it settled that England, the Anglo-Saxon race, should be the dominant force on this continent. When the shades of evening fell on that eventful day the dying Wolfe murmured, "I die happy"; but he could not know how much he had done. Montcalm said, with true divination, that he had struck a greater blow at his conquerors in their victory than he could have done in their defeat, for he foresaw that the English race on this side of the Atlantic would not remain in subjection to the mother country. As one of our historians has truly said, there is no event in modern history more significant, more fraught with great consequences, than the capture of Quebec. We speak of the great significance of the War of the Revolution; we speak of the significance of our Civil War; but the greatest war ever waged here was the war which ended in the triumph of Wolfe upon the plains of Quebec, and which determined that this America should be forever New England and not New France.

With the victory of Wolfe upon the heights of Quebec, says an English historian, the history of the United States began. Montcalm knew well that the only thing that could keep these English colonies a part of England was the danger which they were in from Canada, and he knew that when Canada passed into English control the feeling of independence among these Englishmen was such that they were sure in time to have their separate national existence.

GEORGE WASHINGTON THE EXPANDER OF ENGLAND

With the victory at Quebec truly the history of the United States began. The American Revolution was thus assured. What was the American Revolution? It was a movement which gained us our independence; but it was more than that. We have noticed that Puritanism was English and American. The movement which we call our Revolution had its two parties alike, one on one side of the ocean and one on the other, and Chatham and Burke and their associates in all that conflict stood shoulder to shoulder with George Washington and Sam Adams. Edmund Burke did not find it difficult to see that the men behind the redoubt at Bunker Hill were the true

representatives of the English idea; that Sam Adams was a true Englishman when England set a price upon his head, and George Washington, bombarding the English army out of Boston. England lost America because England at that time had one of those spasms of folly which she has once in about so often.

There are two Englands, I have said—one that always stands for that which is true and progressive and liberal, and the other which is always kicking against the pricks and standing in the way of progress. England has been one of the greatest of nations, the English race one of the greatest races in the history of the world; but from the beginning down to this time England has again and again been up to her knees in wickedness. Through the efforts, the energetic criticism and rebukes of earnest Englishmen—such as, in our time, Cobden, John Bright, and Gladstone, Bryce, and Morley—there has always been reaction from the folly and always hope of progress, and so we trust it may prove today.

Freeman, the great English historian, toward the end of his life wrote an essay upon George Washington as the Expander of England. It seemed to some of us here in America, at first, a rather startling designation. We had not thought of him as an expander, but rather as a contractor, of England; but the title was correct and the historian's insight true. George Washington was the expander of England because he first taught England that her power, that the English empire, could grow only as England everywhere did justice, and that everywhere when she did injustice and struck down the freedom and the rights of men, there her empire was in danger. George Washington drastically taught England that lesson, though she did not learn it immediately. He taught it to us, though it may take us time to learn it. He was the expander of America, and in all the talk of the expansion of the English race let us never think of this as coincident simply with the history of the British empire. We of English blood here in America are as truly a part of the English race as Canada. Our growth has been so great that perhaps we are today the more powerful part of the race. Our growth has been a part of English expansion. That expansion here went on the faster through our independence. It is a question whether the independence of Canada tomorrow might not mean the expansion of England in that quarter from that time on more rapidly and wholesomely than expansion has gone on there in the last century.

THE MOVEMENT FOR THE POSSESSION OF INDIA AND THE DISCOVERY OF AUSTRALIA AND NEW ZEALAND COINCIDENT WITH THE LOSS OF HER AMERICAN COLONIES

I mentioned the coincidence of the planting of Plymouth and the organization of the East India Company. I note another coincidence. Washington began his work as the expander of England in that great struggle of England for North America. In 1753 was his first expedition beyond the upper Potomac to the site of the present city of Pittsburg. His report of that expedition, when he came back to Virginia, was his first appearance in print. The next year it was reprinted in London. Copies of that book by George Washington, printed by somebody in Fleet street, I think, are to be found in the libraries. I love to think that into that little book shop in Fleet street, or wherever it was, there may have strolled one day two very different men, because they were both in London in that same year, 1754, to pick up that book. One of them was a young Irish lawyer who had just come to London and was busy paying attention to almost everything but the law. I love to think how that young Irish lawyer, Edmund Burke, may have come into that little book shop; and of another man, of about Edmund Burke's age and of about George Washington's age, who came back to England that year from India, where he had entered upon one of the most eventful careers in modern times. It was in 1754 that Robert Clive, who had begun his work in India just as George Washington began his work, came back on his first visit to London. In that London book shop they might also have read of the Congress at Albany, New York, at which Benjamin Franklin submitted his plan for the union of the colonies for the purpose of defense—a noteworthy utterance of that idea of federation destined to play so considerable a part in the expansion of England.

The movement for the possession of India by England was a movement precisely coincident with the loss of her colonies here in America. Clive was born in 1725, and died in 1774, just the year before our Revolution broke out. Macaulay compared Clive to Napoleon as a military genius, and said that if Robert Clive had not died in England and had come over here, instead of Howe and Burgoyne and Clinton, we might have had a harder job in getting our freedom. It is worth remembering here that Cornwallis, who, so disastrously to England, surrendered in America, became afterward Governor-General of India and a successful administrator there, as in Ireland. It was under Clive that the foundations were laid of the great British Indian em-

pire. His history reads like a romance. With a few men he was able to crush entirely the French power in India. It seemed in 1755 as if France was much more likely to stay in India than England, but France lost India just as she lost America. The great battle of Plassey, fought by Clive just after the tragedy of the Black Hole of Calcutta and other battles almost miraculous in their results, by which Clive laid permanently the foundations of the British empire in India, is familiar history. Warren Hastings succeeded Clive. He was the first real Governor-General of India, and whatever criticisms may be brought against him, he was one of the most efficient administrators the modern world has seen.

Precisely coincident with the capture of India by England and the rise of the United States of America was the great career of Captain Cook, which more than anything else gave England her great southern possessions in Australia and New Zealand; and now the history of England in South Africa begins. Captain Cook sailed those southern seas, and his reports startled England with a sensation hardly less than that with which Columbus startled Europe. In July, 1776, the same month as that of our Declaration of Independence, Cook sailed on his last voyage. Australia, New Zealand, and the great southern colonies of England have all grown up within the century.

IMPROVEMENT OF THE GOVERNMENT OF THE COLONIES COINCIDENT WITH THE GREAT REFORMS AT HOME

I mentioned Washington as the expander of England. He taught England the great lesson necessary to her expansion. He first taught it, but it was only under Lord Durham that she truly learned it. Lord Durham was one of the greatest Englishmen in the whole history of the expansion of England. He was a modern Englishman, who stood shoulder to shoulder with Peel in the great effort for reform in 1831. It was full of the spirit of that great reform movement that he came out as Governor-General of Canada. He found still a central government, almost as tyrannical as that of the old *régime* which Parkman has exposed to us. He said, and said in a way that made England see and believe it, that if she would hold her colonies she must give them real self-government, and give up that habit of over-governing which had cost France her American possessions. Lord Durham's career in Canada was a short one, but Lord Elgin took up his work and carried it on. Lord Durham's idea spread, and England has continued to hold her vast possessions, and has found them loyal and

enthusiastic helpers. She made her colonies self-governing colonies.

This movement for the improvement of the government of the colonies was precisely coincident with the great reforms at home. This is a thing directly concerning the expansion of England itself which all must remember: her great advances were all along the line—at home and abroad together. We talk of England learning the lesson of honest civil service from the Indian service. The improvement at home and in India went together. Constitutional reforms at home and a true civil service have grown steadily. Coincident with her advance in democracy at home, as illustrated in the time of Lord Durham and Peel, as illustrated in the civil service and in other movements of these threescore years, has come whatever is praiseworthy in the great movements abroad.

In the work of her great colonial administration England has shown us some of the noblest statesmen of modern history, men who have done more almost than any others to make this world more orderly and a better place to live in. Sir George Grey was a typical man in this age of expansion, with whose life we ought to be familiar. His life, beginning in 1812, almost spans the century. He died two years ago. He was the son of one of Wellington's colonels, and early in life, after work in the exploration of Australia, he was appointed governor of South Australia. He was one of the first governors of New Zealand, and one of the first governors of Cape Colony. There is no chapter in his biography more didactic and wholesome than that on his government of Cape Colony, especially that portion showing his judgment of all those movements which, culminating this last year, have brought England to the melancholy pass which we see in South Africa. Most wholesome is the exposure of the futility and fatality of the effort to manage colonial details from Downing Street. Men like Sir George Grey, by the great reform measures for which they strove in New Zealand and Cape Colony, have helped England toward the things which might so easily save her from such folly and sin as this war in South Africa today. It was an Englishman who well said that what South Africa needed at this time was rest and not a surgical operation.

WHEREIN THE MIGHT OF THE BRITISH EMPIRE RESTS

The British empire is an empire today greater than four Europes. Britain has more than half of the trade of the world. Do we realize what a factor the British empire is in the world? The four great facts

of this century are the expansion of the British empire, which a century ago had hardly begun at all; the building up of this English America, which a century ago was merely a little strip of land along the coast, which has extended westward from the Atlantic to the Rockies, to the Pacific Ocean, to the Orient, until it stands the companion of the British empire; the industrial development of Germany, which has taken place with amazing rapidity, and the immense development of Russia. The great development of the British empire, the real development of the British empire, does not lie in the fact that there are three hundred millions in India under her control. It is that in Australia, in New Zealand, in Canada, are great nations of Englishmen growing up strong, with power to stand on their own feet, a masterful race of men, destined to occupy those fresh, green places of the earth.

As to India, it is exceedingly doubtful whether she has been a source of power at all to England, and not rather a source of weakness and danger. No people can be kept permanently in leading strings. A policy which leads to that is a policy which leads to ruin. More and more India is being filled with educated men. They are anxious to take a part in the great life of the world. I talked with one the other day from Calcutta. He said that it seemed to him that America understood India better and was fitted to help her more than England. An Englishman never looks at an Indian without looking down. Americans seem to sympathize with them and look them in the face. He told me the story, so well known in its outlines, of the great development of the Indian National Congress, and of those various movements which are begetting in India a national self-consciousness. The presence of England in India has doubtless been a good thing, on the whole. All the well educated Indians with whom I have discussed it feel that. They say that this is what has opened up the world to them, and that the unity which, along with whatever wrongs, England has brought was necessary. But the British presence there can have a true outcome only as it regards itself as a great school and political training place for those millions of men. It is the greatest problem which ever confronted the English empire. It is only as she looks forward to self-government that India can fare well or England's *régime* in India be true to the traditions of England itself.

French political philosophers used to say that there could never be a large democracy, that the public spirit and unity necessary to a republic could never extend over a large area. They said it because they could not see what the developments of the century would be;

because they knew nothing of the railroad or the telegraph or the modern newspaper. The United States, as we know it, is, for political purposes, a vastly smaller thing than the United States which elected George Washington President. The occurrences of the last two years have taught us much geography and some new things about politics. They have not always kept at the front, I fear, the one great principle of our Monroe doctrine, that important side of it which commands that this republic should stand for democracy throughout this hemisphere. That shipwreck of this principle of friendship for self-government has so often been made for political purposes is indeed to be regretted; but the vicissitudes of the last two years have taught us in America that there are no longer for political purposes two hemispheres, but only one round world. In 1823 the ocean was a barrier; today it is a bridge. America today has no responsibilities and no rights in Bolivia or Venezuela that she does not have in Holland, in Japan, or in the islands of the Pacific. That is one great lesson that is being taught us in this day. We hear a great deal of a federated British empire. Such a federation as that of the United States today would have seemed impossible to the founders of the republic. The thought of a federated empire, in whose parliament representatives from Canada and Australia should sit side by side with the representatives from London and Liverpool and Birmingham, would have seemed impossible to Sir George Grey in his earlier life; yet it is a thought which became familiar to him and is now dawning upon England. Such a federation is one great thing to which we look forward. It may be that it is not important. If the British empire goes to pieces, the great work of the English race will go on much the same. The independence of Canada, of Australia, and of South Africa may come as the independence of the United States came. I confess, however, that I should like to see a federation of the British empire. I think it might be a forerunner of that federation of the world of which the poet dreams. By virtue of the universal order, whose coming that might promote, the banners shall be furled and the war drums cease to throb.

Amidst all the wonderful expansion of territory, amidst all the grasping of filibusters all the way from Sir John Hawkins down to Jameson, the vision in English minds of freedom, of independence, and of an orderly world has been the great and real expander of England, the source of that in English growth which is most welcome and which we most love to consider. A great Swiss scholar, in the home of Calvin, has written better than any Englishman or American,

of whom I think, of modern democracy. He showed us that it was out of the bosom of our English race, out of the Puritanism of Eliot and Hampden and Hooker and Vane, and not out of the French revolution, that the democratic tendencies of the modern world had their rise. England has gone on developing that democracy, but it has been slowly. England has become an enfranchised nation only in our time. When Gladstone, in 1866, championed the first bill for the extension of the suffrage, England had only a little over one million voters in a total of over five million male adults. It was only in 1885 that England really became an enfranchised nation. At that time there were over three millions of "outlanders" in England, and the party which fought the efforts of all those years to make England a true democracy was that very party that in the last two years has been so anxious for the suffrage for certain English gold-miners in distant Africa!

England is in many respects, let us be quick to acknowledge, a more democratic nation than we are. The will of her Parliament is always the mirror of the will of her people. In the wonderful extent to which her people are doing things upon a coöperative basis, in their municipal achievements, the operation of street railways, and the doing of other things by the people for the people, England is making herself a truer commonwealth than our own. She is cumbered by her monarchy and hereditary aristocracy, and needs republican forms. We are thankful for anything in which she outstrips us, as we are thankful for anything in which we outstrip her. We have done wrong, even as she has done wrong, and we both sadly need purgation today; but the English race here and there, through the centuries, has been working for freedom, for the extension of edifying political ideas, and for better things.

As the American walks the corridors at Westminster, his heart does not beat fastest when he sees the painted kings upon the painted windows of the House of Lords, nor even when he stands by the white form of Hampden at the Commons' door; it beats fastest when, in the great series of pictures of English history, he looks on that of the Pilgrim Fathers leaving England to plant New England. England, who hurried them out, will not let that scene go today as a part of American history only, but claims it as one of the proudest scenes in her own history, too. It is a grateful thing. May the mother country and the daughter country stand shoulder to shoulder—never when either lapses into sin and does the deed of shame, but always when either is devoted to whatever makes for the peace and freedom of the world.

THE ROAD TO BOLIVIA

By William E. Curtis

(*Continued from the June number*)

Ninety per cent of the population of Cuzco are pure Indians, and the Quichua language, spoken by the Incas, is still in common use. The whites, who are comparatively few, are priests and monks, government officials, *haciendados*, and a few foreign shop-keepers, mostly Germans. The old families still retain ancestral homes filled with massive furniture, gilded mirrors, and costly hangings brought to Peru 250 years ago, when it was the richest and most extravagant country on earth and when the nobility and wealth were concentrated at Cuzco. Most of these houses are in a state of advanced decay, for their proprietors are suffering from hereditary and incurable diseases called pride and poverty. Their estates have been ruined by neglect and devastation of revolutionary armies, their mines are no longer profitable because of the low price of silver, and now nobody knows and many people wonder where they find the means of sustenance. Their pride will not permit them to work, and their poverty makes it impossible for them to develop the natural resources that lie dormant in their property. If their ancestors had shown as much energy in that development as they displayed in searching the Incas' ruins for treasure, there would have been permanent prosperity. Even now, after 350 years' digging for secret places of concealment, the Spanish inhabitants can always raise money somehow to pay the expenses of further excavations.

For more than three centuries the inhabitants of that region and the speculators of Europe have been plunging year after year into the icy waters of Lake Urcos to recover a golden chain of the Inca Huaina Capac, which was thrown there to spite the Spaniards. It was of pure gold, wrought into links about one foot in length and as large as a man's arm, and long enough to stretch twice around the grand plaza in Cuzco, which is nearly as large as Lafayette Square, in the city of Washington. At one time a syndicate was organized, with a capital of $5,000,000, to bore a tunnel to drain the lake. After spending a large sum of money it was found that the mountain was composed almost entirely of living rock, so that the enterprise was abandoned.

DESCENDANTS OF THE INCAS

It was at Cuzco, more than a hundred years ago, that Tupac Amaru, "the Last of the Incas", a descendant of Huascar, organized an uprising of the Indians to exterminate the foreign invaders of Peru; but he was betrayed and taken prisoner, and, after being compelled to witness the execution of his wife and son, was himself "quartered" by wild horses in the great square of Cuzco, under the walls of three churches dedicated to a merciful God. Iron rings were forged upon the wrists and ankles of the young Inca, to which four chains were attached, and each chain was hitched to a restive and powerful horse. When the cruel arrangements were completed the master of ceremonies

cracked his whip at the frantic animals, and each horse started in a different direction, tearing the body of Tupac Amaru into four pieces.

Cuzco is 11,380 feet above the sea, and occupies one of the most beautiful sites ever selected for a city, which, according to tradition, was chosen by Manco Capac and Mama Occlo Huaco, those mysterious beings who taught the arts and industries to the savage Indians of the Andes and founded a dynasty that grew in power until it dominated half the continent of South America. The climate is salubrious and healthful. Within 20 miles down the valley all the semi-tropical fruits and vegetables are produced, and, although the soil has been cultivated for centuries, it still yields harvests of all the staples of the temperate zone.

On a hill known as Sacsahuaman the first Inca built his palace, which was surrounded by temples, convents, and fortifications. The nuns of St Catalina now occupy the restored ruins of the palace of the Virgins of the Sun. The friars of Santo Domingo occupy a magnificent and extensive monastery, rebuilt from the walls of the Temple of the Sun, which was perhaps the most extensive and imposing building in America. The accounts of its splendor and riches that have come down to us from those who destroyed it are beyond belief. They said it was four hundred paces square, and inclosed courts, gardens, shrines, and various other apartments decorated with gold for religious sacrifices and ceremonies. The cornices were of solid gold, and at the eastern end of the great courtyard a massive plate of gold, representing the sun, spread from one wall to the other, 60 feet in diameter. The walls of a dozen other temples, palaces, convents, and fortresses still are utilized, so that it is easy to define the outlines of the ancient city, and if the stories that its conquerors told are only half true they sheltered an accumulation of riches whose value is beyond computation.

There is little of interest to the modern traveler outside the ruins and the ecclesiastical edifices which the Spaniards erected upon them. The market-place, particularly on Sunday morning, is worth visiting; but the Indians are a sullen, reticent race and lack the dramatic and picturesque characteristics that make the Amayras of Bolivia so attractive. A few Americans live in Cuzco—two Protestant missionaries, a dentist, a miner or two, and the men who are building a stage road to connect with the railway.

One day in a country village we got a glimpse of a curious custom among the peasants. Squatting in the churchyards, in a row, were

ten or twelve women from the mountains, while opposite and facing them were an equal number of surly looking men. Between the two was a rude cross, held upright by a few stones laid against its base and trimmed with artificial flowers. The *alcalde* explained that the men had been brought there for discipline. They were charged by their wives with drunkenness, abuse, neglect, and improvidence, and the village priest would hear the evidence, render judgment, and administer correction the next morning at 8 o'clock. When asked what sort of correction would be administered, he shook a stout stick, and

AN INCA CEMETERY

remarked that he would lay that on the backs of the worst ones, while the others would be sentenced to various forms of penance.

Before the railway was built it was a journey of 30 days from Cuzco across the desert to Bolivia, and even now some people prefer to go that way. Thousands of burros and llamas are still engaged in competition with the railways transporting ores, wool, hides, and carrying back into the mountains cotton goods, hardware, and other merchandise.

The *arrerios* are usually accompanied by their entire families, and

as their lives are spent coming and going across the burning sands of the desert, it is a matter of indifference how long the journey lasts. The animals are the capital of the *arrerio*. The desert is his home. His wife helps in the driving and sleeps by his side on the sand. They have no shelter, but wrap their *ponchos* around them and lie down to pleasant dreams with their bare feet and legs exposed while ice forms in little streams around them. As the camel to the people of the deserts of Asia, so is the llama to those who dwell in the Andes, a faithful and enduring beast, without which they would be helpless, for mules and horses cannot endure the rarefied atmosphere. Even the burros have their nostrils slit in order to breathe. When a horse is first brought into the high altitudes of the Andes, the blood drips from his mouth, ears, and nose. Mules are more enduring, and burros are better still, but the llama is native to the snow-clad peaks and thrives best where other animals find existence impossible.

This mysterious region is the most elevated of human habitations excepting Tibet, which is known to Asiatic geographers as the "dome of the world." The latter represents only mountain pastures, but the great Andean basin supports towns and cities, affords food for herds of cattle, llamas, vicunas, and sheep, and produces annual harvests.

Here, at a mean level of 12,645 feet above the sea, is a lake almost as large as Lake Erie, the highest navigable water, of immeasurable depth. The fossils upon the mountains that inclose it leave no room to doubt that within a recent geological period it formed a vast inland sea, extending possibly over the entire basin between the two ranges of the Andes, whose waters now have no visible means of escape. The eastern boundary is formed by the loftiest mountains of the American continent and the greatest continuous snow range in the world. Nowhere else within human vision can such a battalion of monsters be seen, and in sunshine they remind one of a procession of mighty icebergs, rising with majestic dignity behind a screen that is formed by the intervening foothills.

A curious phenomenon is that metal never rusts in the waters of Lake Titicaca. You can throw in a chain, anchor, or any article of ordinary iron and let it lie for weeks, and when you haul it up it will be as clean and bright as when it came from the foundry; and, what is stranger still, rust that has formed upon metallic objects elsewhere will peel off when immersed in its waters.

The greatest interest centers in the Island of Titicaca, the Eden and Nazareth of the Inca traditions, where appeared their Adam and Eve,

the children of the Sun, to redeem and regenerate. Early in the Christian era a man and a woman appeared one morning in the presence of the astonished natives on the Island of Titicaca, who said that they had been sent by the Great Creator, the father and ruler of all things, who inhabited the sun, to lead them into a better life, to teach them the knowledge of useful things and improve their condition. Previous to the arrival of these mysterious missionaries the Peruvians were divided into rude and warlike tribes, ignorant of useful industry and culture, knowing no law and no morals.

The Island of Titicaca is now the property of Mr Miguel Garces, of Puno. A village of 700 or 800 Indians are living in mud huts and raising wheat, barley, and potatoes among the remnants of the earliest culture of America. The island lies a mile or so from the main shore, from which it is separated by a bottomless channel. The nearest port is the little town of Calle. There is no communication except by *balsas*, the curious craft that are older than history, and were used by the Incas, as they are used by the Indians today, for transportation. They are built of barley straw, tied together in bunches, and then bound by wisps in the shape of a double or treble gondola.

The Indians who inhabit the island are usually docile and industrious, for they are compelled to wring a scanty living from the unwilling soil, and are assiduous in their religious duties at a little chapel attended by a native priest, although they still retain many of the rites of their aboriginal religion.

The ruins of the palaces and temples which formerly covered this sacred place have been the object of investigation by archæologists for nearly four centuries—ever since they were destroyed by the Spanish invaders—and much of the material used in their construction has been carried away for building purposes, both upon the island and the mainland. It is remarkable that even one stone should be left upon another during the 360 years since the *conquistadors* invaded the peaceful precincts of the place, for they destroyed and plundered everything of value, and those who have been searching for the secrets of the extinct civilization have overturned nearly everything that the Spaniards left. Among the best preserved of the ruins are the royal baths of marble, as sumptuous as those of Italy or Greece at a similar period. The bottoms were carefully covered with a mosaic of small stones, and the water was received through the throats of the eagles, condors, and serpents wrought in gold and silver.

BALSAS ON LAKE TITICACA

Upon the Island of Coati, six miles from Titicaca, was the harem of the Inca, where the remains are much better preserved than those upon the Island of Titicaca, and the principal walls are almost intact. This island was dedicated to the moon, and in the convent were many concubines selected for their beauty and their blood.

The little port of Chillilaya lies at the southern extremity of Lake Titicaca, and is reached by a weekly steamer from Puno, the terminus of the southern railway of Peru. La Paz, the actual capital and commercial metropolis of Bolivia, is 45 miles further on, reached by a road almost level at an elevation of 12,500 feet above the sea. The stage-coach, drawn by eight mules, is driven by a jehu whose language and

gyrations are calculated to excite alarm among nervous people who do not know that mule-drivers in South America always act that way. Beside his long whip, which is handled with great skill and accuracy, he carries a bag full of small stones, and shies them with an aim that David himself could not have excelled. Indeed, he can touch the tip of the ear of the leader of his eight-mule team nine times out of ten with a pebble not larger than a pigeon's egg. The road is covered with boulders that vary in size from a baseball to a washtub, round and smooth, and they are strewn from one end of the journey to the other. It seems as if all the boulders in the world had been collected and dropped into the roadway.

Like the rest of the great plateau that lies between the two ranges of the Andes, the area from Lake Titicaca to La Paz is divided into a few enormous farms, dotted with groups of stone huts that have been occupied for generations, and even centuries, by the ancestors of the tenants who till the ground and herd the sheep and cattle. The relations between the landlord and tenants are similar to those of the old feudal times in Europe. The former exercises patriarchal authority over the Indians that live upon his lands, and they serve him with loyalty as long as he allows them a measure of independence. The *haciendas* seldom change hands. The property is inherited by one generation from another, and the customs of the country are so fixed and rigid that they are seldom violated by either employer or employed.

The stone huts of the tenants are usually found in little groups or villages, and occasionally among them you find a little chapel which is attended by a *padre*, who exercises an influence among his parishioners even greater than that of the *haciendado*. In addition to his spiritual ministrations, the *curé* is expected to maintain a school for the children of the parish, but in most cases these duties are purely theoretical and the Indians remain untaught.

As the journey to La Paz approaches its end, the traveler enjoys a startling surprise. The highway across the plateau leads to the brink of a cañon 1,100 feet deep, whose walls are almost perpendicular, and which in color and topography resembles the Grand Cañon of the Colorado. At the foot of this mighty gorge lies the capital of Bolivia. The first glance shows a vast expanse of red-tiled roofs, occasionally broken by bunches of foliage or graceful spires, and a river tumbling down from the mountains is crossed by picturesque bridges of massive masonry centuries old.

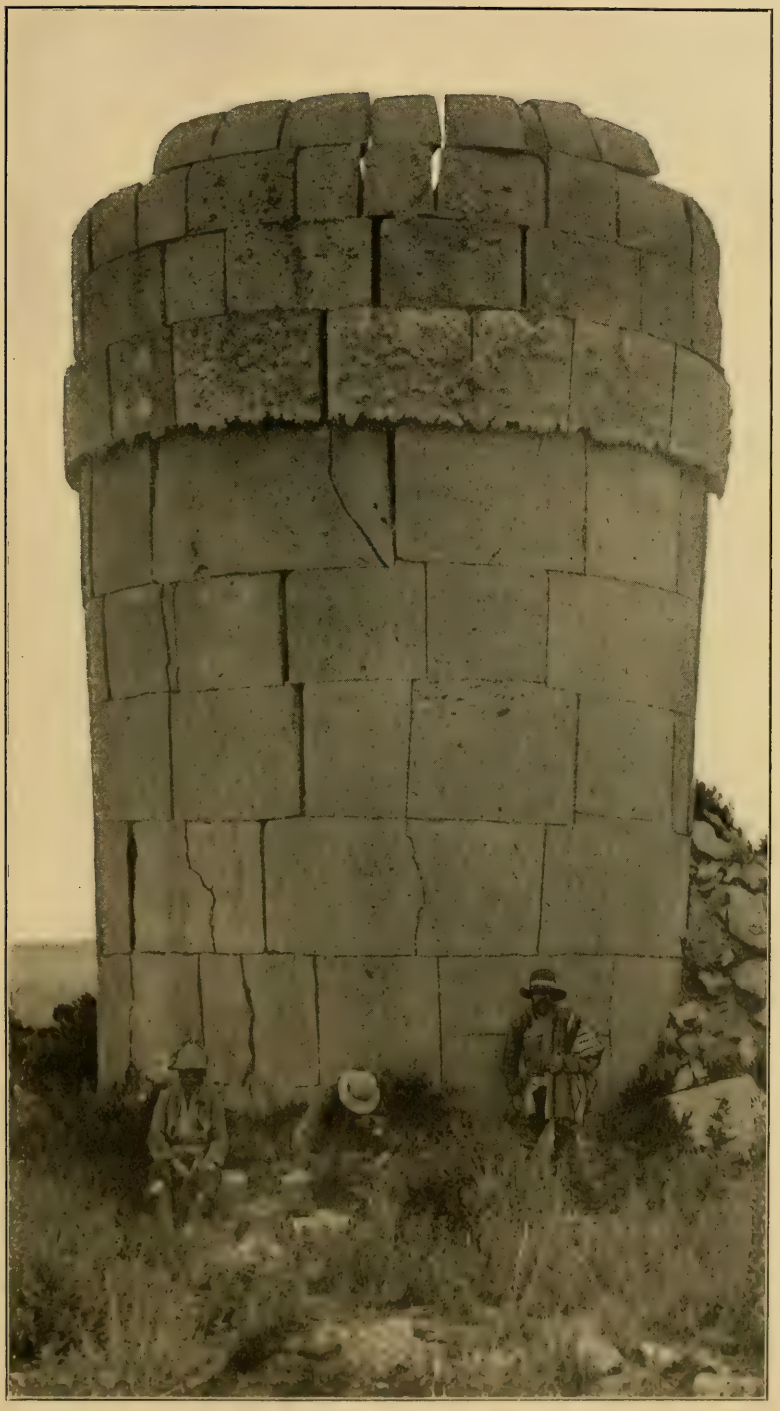
Rome, you know, sat upon seven hills, and if that is an advantage,

La Paz is more notable than the Eternal City, for it covers forty hills and hollows. Two or three of the main streets that lie along the ridges are reasonably level and wide enough to accommodate the traffic of a population numbering 60,000 or 70,000. There has never been a reliable census. Fine houses of heavy walls of stone or adobe are painted in giddy colors—blue, green, pink, purple, or orange—and often embellished with fantastic designs that are very much admired by the Bolivians, who love gay color, music, and motion; but most of the streets are narrow and steep like stairways, with sidewalks, except the *plaza* and the principal trading streets, and paved with small cobblestones, with the sharp ends up, so as to lessen the danger of slipping in damp weather. The best hotel we have ever found in South America occupies the palace of the former viceroy. The unfinished cathedral, which adjoins the government "palace", where the president resides and the heads of the executive departments have their offices, is an enormous structure, large enough for a city of ten times the size of La Paz. The brick walls, eight or ten feet thick, are veneered with dressed stone, and some of the carving is beautiful.

Other cities in Bolivia are not so far advanced as La Paz. Most of them still adhere to the antiquated manners and methods which their ancestors brought from Spain. There is certainly no part of America—I think it safe to say that there is no spot in the civilized universe—that is so far behind the age or where the modes of the Middle Ages prevail as they do in Bolivia.

The *plaza*, which is overlooked by the windows of the hotel, is a pretty place, has a fountain from which the poorer families draw their daily supply of water, and a number of well-kept plants. Every alternate evening, at eight o'clock, a military band plays, and the entire population turn out to promenade. It is almost their only social diversion, as opera and theatrical companies seldom take the trouble to go so far as La Paz, and the exchange of hospitality is limited chiefly to the men. On the other nights the band plays in the Almeda, a handsome promenade shaded by eucalyptus trees and furnished with rows of iron benches.

At the elevation of 12,500 feet above the sea the atmosphere is so rare that breathing is difficult, and people afflicted with heart disease or weak lungs or a superabundance of flesh must avoid exertion as much as possible. The veins in your head feel as if they were about to burst. You pant like a tired hound as you climb the steep streets



INCA BURIAL TOWER NEAR LAKE TITICACA

of the city or the stairway of the hotel, and are compelled to stop every few moments to recover your breath. There are sharp pains in the lungs, a drowsiness about the head and eyes, and when you lie down to sleep at night your heart will thump against your ribs like a pile-driver.

The temperature reaches 80 at noonday and falls to 24 degrees at night in winter. During the summer months the extremes are almost the same. The lowest record for 1899 was 19 degrees above zero. The maximum was 84. The temperature often varies 50 degrees in 24 hours. The extremes are less inside the walls of the houses, which are so thick that the heat does not penetrate them. It always seems colder indoors than out, and, as there is no way of warming the houses by stoves or furnaces or fireplaces, it is very uncomfortable. We lit all the lamps we could get, regardless of the extravagance, for the hotel-keeper charged 60 cents a night extra for each of those luxuries and 25 cents for candles. We put on overcoats and hats, wrapped our legs in fur robes, and huddled around a center table, trying to be amiable and happy, but it was no use. The only warm place was the bed between the blankets. There is only one stove in La Paz, and that warms the office of the American legation. Mr Bridgman, our minister, brought it from New Jersey and had a ton of coal shipped from Australia through the railway people at Arequipa.

The natives are short, stocky fellows, beardless and broad-shouldered, with great powers of endurance and a courage and stoicism similar to that of the North American Indian. Their ancestors formed a part of the Inca Empire, having been subjugated by the Peruvians 200 or 300 years before the Spanish invasion. Their food consists chiefly of beans, dried peas, parched corn, dried potatoes, and cocoa, while they chew coca constantly. The coca habit among the Bolivians is as general as the opium habit with the Chinese or smoking among the Irish.

A very interesting character frequently met with in the Andes is the *Callaguaya* or Indian doctor, as he is familiarly known. You find him everywhere—resting upon the benches of the *plazas* in the city, tramping over the mountain trails, sunning himself against the wall of a cabin by the railway station, drinking *chica* in the market place, inspecting cattle in the corral of the *hacienda*, and curing the sick persons in their mud huts. You find him in the railway cars and among the deck passengers on the coast steamers, where he pays his way by practicing his profession. With no wardrobe but the clothes upon

his back and a bright-colored *poncho*, he travels barefooted from the Isthmus of Panama to Magellan Strait, carrying a pack filled with dried herbs done up in neat paper packages, cheap jewelry, pocket handkerchiefs and ribbons, watches and other articles for personal adornment, knives, forks and spoons, scissors, small mirrors, combs and brushes, and other small merchandise, which he sells for cash or trades for eggs and poultry, chocolate, beans, and cocoa, to be exchanged at the next town for more portable property.

The Indian women are ingenious and industrious, and have remarkable taste in colors and designs. They love gay tints and embroideries and wear quantities of adornments. They have a distinctive costume of home manufacture, which the dealers in imported goods fortunately have not been able to disturb. They usually wear a little Panama hat, braided of soft white fiber, with a black band, perched jauntily upon their abundant black hair, which hangs in two long braids down their backs. Their dresses resemble those worn by the peasants in the Tyrol. The short skirts of gay colors hang above the shoe tops, and reveal gay hosiery and native shoes of bright-colored leather, with long laces and high French heels. Sometimes the shoes are white, sometimes yellow, red, or purple—the brighter the better—and any color except black. Under the skirt are an indefinite number of white petticoats, elaborately embroidered and edged with lace. The waists are made of bright-colored calico, velveteen, and other fabrics, and around their shoulders they wear light shawls or scarfs, called *rebozos*.

The men go barefooted and barelegged and wear short, wide trousers of dark woolen cloth that are slit up the back as far as the knee, so as to give their legs free action in climbing the mountain trails. Under these trousers they have white cotton drawers, which always seem to be clean and well laundered. Upon their heads they wear close-fitting caps or hoods of knitted work or some dark woolen cloth that fit closely down over the ears and the neck like the hoods children wear in cold weather in New England. Upon this they wear hats of straw or felt, while their bodies are protected by the inevitable *poncho*, which is their coat by day and their blanket by night, a comprehensive as well as comfortable garment.

Colonel José Manuel Pando, the successful leader of the late revolution in Bolivia, chief of the liberal party and President of the Republic, resembles General Grant in appearance and manners. He is a stubborn man, so self-contained, silent, and immovable that they call him

the Sphinx. Short, solid, athletic, without an ounce of surplus flesh, accustomed to hardships, fond of frugal living, with a great capacity for physical endurance, he has spent the major portion of his life campaigning in the mountains and exploring the wilderness on the east slope of the Andes.

A celebration of the feast of the Asuncion occurred in a *plaza* in the northern part of La Paz. It is one of the most popular festivals in the calendar, and called in from the country several thousand Indians, who took possession of the town from noon of the day preceding the anniversary until toward night of the day following.

Along about two o'clock in the afternoon began the dances and other ceremonies which have been inherited from the days of the Incas, and which are said to be of serious significance, like the ghost dances of the Sioux, the corn dance of the Navajo, the snake dance of the Moki, and similar rites practiced by the red men of North America. Each group of dancers was attended by a band of musicians playing native instruments. There were some modern drums imported from Europe, but more of native manufacture, made of hollow segments of trees covered with goat skins; native guitars and mandolins, rude pipes of bamboo, and long trumpets of reeds. The music had no harmony or melody and was all in the minor key. Those who were not singing or dancing kept up a continuous chant in dreary monotones, and the leaders moved among them, gesticulating violently with their heads and arms.

At intervals the music and motions would cease and the performers would refresh themselves with copious draughts of *chica* and alcohol. The dancing and drinking continued all the afternoon and far into the night, until everybody was in a distressing state of intoxication. The pavement was covered with the bodies of men and women who were unconscious from drink and fatigue and the remainder were howling in the streets.

Not far from the Island of Titicaca a narrow peninsula projects into the lake, on which is a small town of great fame—the residence of the patron saint of Bolivia. Here in prehistoric times was the seat of a celebrated oracle, with an extensive group of temples and monasteries and the place of assembly of princes, priests, warriors, notables of the empire, as well as the common people, for the spring festivals which took place every year. The only ruin of importance which remains is a series of thrones upon the slope of a hill near Copacabana, which were evidently "the seats of the mighty", from which the Incas or the

priests addressed the people and witnessed the festivals. Some scientists hold that their age is greater than the Inca dynasty, and that they were the seats of judgment from which earlier monarchs pronounced decrees and proclaimed edicts. However that may be, they are among the most extraordinary relics of an extinct civilization. The early

BOLIVIAN SOLDIERS

Catholic missionaries did not resist the native customs of the Indians, but with exceeding skill amalgamated the most important of them with the authorized festivals of their own church. Upon the ruins of the pagan temples and with the same material of which they were built they erected at Copacabana a magnificent edifice, and upon the

BOLIVIAN MINERS

oracle seated an image of the mother of Christ, more renowned than any other effigy in America, and made her shrine the scene of the annual festivals which called together the inhabitants of the entire Andean region. Farmers, merchants, and manufacturers for hundreds of miles take advantage of the gathering to drive in llama trains laden with merchandise of all sorts. The people of the north exchange products with the people of the south, and the barter amounts to hundreds of thousands of dollars every year.

The great church, built early in the seventeenth century, must have been a beautiful structure when new, and even in its present state of decay and neglect it is imposing and attractive. Before each altar is a table with a tin receptacle for candles, the smallest offering that a poor devotee may make to his patron saint, and thousands of them are constantly burning during the festival week. Here and there is a pathetic evidence of penitence in the form of wild flowers laid by the hand of some maiden upon the altar of the Holy Mother.

The image of the Virgin of Copacabana, the patron saint of Bolivia, stands upon an altar in a little chapel reached by a narrow stairway. The hollows in the steps tell of the millions of feet that have turned that way during the centuries she has been enthroned there, and her immense wardrobe, including many rare examples of embroidery and lace, and her large collection of jewels indicate the value placed upon her blessing. One of her rubies, fully an inch and a half long by an inch in thickness, curiously enough, was presented by a Turk who spent some years in Bolivia. It is said to be one of the finest rubies in the world. She has also a valuable collection of pearls. The image is about three feet in height, and, with the exception of the face and hands, is covered with embroidered robes and decorations of gold and silver of elaborate and artistic designs. The crown of gold, heavily set with jewels, is an elaborate piece of work, and the halo of the same metal, at least a foot in diameter, is encircled by ten diamond stars. In her hand the Virgin holds a candlestick and her arm supports a basket of gold filigree work, which is filled with costly jewels. The buckle of her belt is a cluster of large diamonds and her robe sparkles with other gems.

The peculiarity of the image, which is considered proof of its miraculous origin and attributes, is its power to emit light. I was not there in the evening and cannot bear personal testimony as to the phenomenon; but Professor Bandelier and others entirely worthy of confidence declare that after dark the little chapel is always

diffused with light, which proceeds from no fixed source, but is always sufficient to distinguish the outlines of articles upon the altar and objects upon the walls, and my informants were unable to detect any evidences of trickery. The image is said to have been carved in the sixteenth century by an ignorant Indian, to whom the Holy Mother herself sat as a model.

Persons who desire to receive the blessings of the Virgin pay a fee to a monk in the cloister of the adjoining convent, and are allowed to pass into the little chapel, where service is continuous night and day during the time of the festival. Bearing lighted candles in their hands, they approach the altar-rail and kneel. A bridal wreath is suspended by long strips of broad white ribbon in the center of the chapel. In a little gallery over the entrance is a band of music, with a cabinet organ, two horns, a flute, a 'cello, and a native instrument made of reeds. Behind the altar-rail stands a monk, assisted by two barefooted acolytes. As the devotees approach the altar, the acolytes take the candles from their hands and place them in the rack prepared for that purpose. They then kneel as closely together as possible in front of the altar, and a robe of white satin embroidered in silver, formerly worn by the image, is spread over their heads. The officiating monk moves his hand rapidly over the mantle and utters a blessing. The robe is then lifted and the worshipers depart with precious consolation.

In these few pages we have been able to see but little of that strange land where the sun shines in the north and Christmas comes in midsummer, but I hope that the little glimpse I have been able to give will induce many to make the journey thither. The compensations are greater than those offered by most of the countries to which our tourists go. The voyage, after you pass Panama, is the most delightful that the ocean offers, and the opportunities for investment are surpassed nowhere else. It is unfortunate that we know so little of the South American republics when they offer so much of value to us.

THE CHINESE "BOXERS"

By Llewellyn James Davies

The society or league which is now turning China upside down and forcing the attention of the whole world is known by various names. The one most commonly seen in the American papers is the "Boxers" or "Spirit Boxers." The origin of this name is to be found in the gymnastic exercises which constitute the drill of the society and in the mysterious incantations used. In the Shan-tung Province the society is commonly called the "Ta Tao Hui," or "Great Sword Society." This is one of the names used by the society itself, and is a general name. On the cards and posters issued by the society other names occur, which I understand to be of local use.

The "Boxer" society is one of the many secret societies of China, and, as is usual with such societies, has both a political and a religious significance. It is said to be of ancient origin. One Chinese tells me that it had its origin in opposition to the "Manchu dynasty", which has ruled China for the past two hundred and fifty years.

Whatever may have been its past history, the society has now collected its forces against the foreigners within the Chinese Empire. It has been preparing for this present outbreak for several years. About three and a half years ago I learned from Chinese friends that such a society was being organized, and that it was growing rapidly. Its anti-foreign purpose was known distinctly at that time. It was said to be spreading from the south toward the north. Those favorable to governmental reform and to foreign influences in the districts now overrun by these marauders felt and reported what may be called the ground-swell of the storm which has now so furiously burst upon them. Chinese Christians were told, "Well, you will soon have a chance to enjoy the heaven of which you talk;" and, "Soon, soon; your time is coming soon." Shortly before the outbreak it was frequently and plainly said that at no very distant date all foreigners and foreign sympathizers would be killed.

In organizing this movement the leaders established at convenient centers what were called "ying," or "encampments." The members of the society living in the neighborhood met to drill and recite their incantations at these places, and here new members were initiated.

Each encampment had, of course, a leader who was responsible to the higher officers. A card sent to each of these encampments, naming the place of the proposed attack and stating the number of men required from each, called out a party of such size as the leaders desired.

The vast majority of the Chinese are entirely ignorant of the simplest facts of natural science. To them the earth is still flat, and the sun is said to pass around behind a mountain in moving from west to east. The more superstitious worship the spirits, which are supposed to abide in or have charge of their spinning-wheels, hand-mills, stables, wells, manure heaps, street gates, and many other things. I know one man who is said to have worshipped thus over thirty spirits, believed to reside in various parts of his three-roomed hovel. Occultism and spiritism are rife.

The organizers of the "Boxers" have used this superstitious disposition for the furtherance of their ends. They have confidently asserted that those properly initiated into the mysteries of this cult, and whose "Kung Fu" or exercise of its rules was perfect, would by virtue of this practice become invulnerable, and thus be protected against all bullets or knives. This was not left to future test entirely. Several intelligent Chinese have told me that they had themselves seen advanced members of the society strike different parts of their bodies with sharp knives and swords with no more effect upon the skin than is produced by the wind. The members of the society believe implicitly in this invulnerability, and the people at large are convinced that the claim is well founded. No difficulty is found in explaining the death of society members in battle. In one instance, occurring early last fall, 30 or 40 miles from Tsi-nan-fu, 10 or 12 "Boxers" were killed by Catholics whom they had attacked. It was then discovered that on the evening before or on the morning of the battle these men had broken the rules of the society by eating certain proscribed articles of food. In this way their death but strengthened the faith of those remaining.

It was proposed at first to use no fire-arms in the extermination of foreigners, but to trust to the sword alone. Great reliance was placed on certain calisthenic exercises and posturings which were expected to hypnotize or terrify the enemy.

The "Boxers" are a patriotic party. Whether this means loyalty to the present dynasty or not is questioned. The Chinese have never forgotten that their rulers are foreigners. Manchu and Chinese are still distinct in dress and customs. The feeling seems to be quite

general among the people that the "Ta Ch'ing," or "Great Clear," dynasty has about run its course, and there is said to be in one of their sacred books a prophecy the fulfillment of which in the displacing of the reigning family is looked for at any time. Outwardly at least the "Boxers" are loyal to the Manchu dynasty. Their motto, seen on cards left by them with Christians whom they had robbed, is "Pao Ch'ing mieh yang." Literally this means, "Protect the Clear (present dynasty), exterminate the foreign." In idiomatic English it is, "Death to foreigners! China for the Chinese." From the beginning of the outbreak the avowed object of the society has been the expulsion from the country of all foreigners. This is no sudden turn in affairs, but rather a natural outgrowth of the general anti-foreign feeling. In a recent issue of the *Philadelphia Press* a prominent Chinese is reported to have said, "Foreigners of every nation are objectionable to a large majority of Chinamen, and when they see Europeans and Americans coming there, getting valuable concessions and preparing to cut up the country with railroads, they fear the invasion will eventuate in the extinction of sacred customs, and that the white man will rule the country." This statement expresses very fairly the mind of the Chinese people. They look down on every foreigner as a barbarian, and, since they have learned something of the power of European arms, to the contempt is joined fear. To this may perhaps be added a sense of injustice, resulting from the treatment received recently from more than one of the European powers. For example, both official and non-official people of Shan-tung complained bitterly of Germany's injustice in seizing Kiao-chau, and, whether rightly or wrongly, believed that the imperial German government had but used the murder of the German missionary priests to further its prearranged political plans.

From these three elements—contempt, fear, and sense of injustice—has been developed in the anti-foreign Chinese party a spirit of bitter animosity. The "Boxer" movement is but an expression of this hatred. It must be borne in mind, however, that economic conditions greatly assist the organizers. In good seasons the people of North China must secure two crops each year from the same land in order to maintain a condition of average welfare. If the spring yield fails there is considerable suffering, and if both spring and fall crops are bad, conditions of local famine result. A considerable proportion of the people are therefore always on the verge of destitution. In seasons of distress highway robbery is very frequent. The more

wealthy travelers carry arms, and during the winter months housebreaking is so common that one or more members of well-to-do farming families watch all night. Hence, beginning by looting the homes of Christian Chinese, the "Boxers" proper attracted to themselves a great company of the hopelessly poor, who, joining them for plunder, would be as ready to fall away when booty was no longer to be obtained. The anti-foreign character of the outbreak was apparent even in this robbery, as in more than one instance when those who were in no way connected with the foreigners had suffered, their goods were returned to them and apologies offered.

There is no evidence of a distinctively religious animosity in this disturbance. It is, of course, true that in a few minds the fear exists that the new religion will overthrow the old. But it is doubtful whether there has been sufficient growth in the Christian Church to generally excite this fear. Missionaries are attacked, not as religious teachers, but as foreigners, and Chinese Christians are robbed and murdered as those who "sui yang kwei tsi" or "follow the foreign devil," and not because they have changed their religion. The attacks have thus far been borne chiefly by the missionaries because they have gone to the interior, while most of the merchants are in the coast towns and treaty-ports.

Those who know the Chinese people find much to admire both in individual traits and in national customs. But the government of the empire is a tangle of "ways that are dark and tricks that are vain." The Chinese method of the past sixty years, of so-called intercourse with foreigners, is very aptly expressed by this quotation. The official class has never taken foreign relations seriously. In case of trouble the programme has been to promise everything, but to do nothing which by any means could be avoided. Local officials have more than once directly instigated anti-foreign outbreaks which have resulted in murder or destruction of property, and when the demands of the foreign government could be resisted no longer, have been degraded by the Pekin government; yet when the dust had settled sufficiently into the eyes of the too easily deceived foreigners, the same officials have reappeared in positions of greater prominence. The Chinese, high and low, are adept actors. Li Ping Heng was governor of Shan-tung Province at the time of the seizure of Kiaochau by the Germans, following the murder by bandits of two German priests. Among other concessions secured by the German government was a decree against Governor Li perpetually disabling him

from holding any office. This decree was simply two big handfuls of dust, for in a short time this same Li Ping Heng was appointed to an office of great importance in the north, and it is reported that he is now one of the Empress Dowager's chief anti-foreign advisers.

In dealing with the "Boxers" the authorities of China have but continued these methods. The anti-foreign party has beyond question hoped for opportunity to rise against all foreigners and "drive them into the sea." Li Ping Heng petitioned the Empress Dowager to be allowed to resist the Germans at Kiao-chau by force of arms. Again, something over a year ago, it was commonly reported and believed that General Tung Fu Hsiang, during audience with the Empress Dowager, requested permission to use his soldiers, who were like himself bitterly anti-foreign, to attack the foreign legations in Pekin, and that he pledged himself to make short work of the ministers. It is said that the Empress showed signs of pleasure at his "loyalty" and of regret that she feared to follow his suggestions. It was under a governor of similar spirit that the "Boxers" began operations in Shan-tung last fall. In response to the representations of the missionaries, whose converts were being looted, he refused to admit the existence of any organized society, and it was not until two or three counties were in a state of practical anarchy that soldiers were sent from the capital. The avowed purpose of these troops was to protect the Christian Chinese from robbery and to catch and punish the outlaws. The real animus of the governor was shown when he recalled and degraded the officers who had punished the "Boxers" in a severe fight. The "Boxers" openly claimed to have the governor's sympathy, and after this battle the depredations were unrestricted. The Chinese soldiers had evidently been given orders not to harm the insurgents; for they refused to interfere, though called upon, even when the outbreak occurred within two or three miles of their camp. The recent action of the Empress Dowager in reprimanding General Nieh for attacking the "Boxers," who were destroying the railway from Tientsin to Pekin, is but a repetition on a larger scale of what the governor of Shan-tung did at the beginning of the troubles. In Shan-tung one county magistrate is said to have sent word to the rebels: "Save my face, and don't enter this city (county-seat); no Christians live inside the city." The magistrate of Po-ping county said: "Our own people we will protect, but not the converts of the foreigners."

It is the theory of the Chinese government that the people are nat-

urally ignorant, and that its officials are sent to all parts of the empire to instruct them in the duties of life. In a recent proclamation, when referring to troubles with foreigners, the Empress Dowager said: "The stupid and ignorant people who circulate rumors and stir up strife, proceeding from light to grave differences, are most truly to be detested. On the other hand, the officials, who have not been able at convenient seasons to properly instruct the people and prevent disturbances, cannot be excused from censure." The character of the instruction given the people may be seen in the following quotations from a pamphlet, issued a short time before the beginning of the present outbreak, by a county magistrate named Chao, at that time holding office in Hsia Chin County, Shan-tung Province: "Their religion is such as China never had, and is antagonistic to the doctrines of the sages, such as family relations, the laws of benevolence, and righteousness. In this regard these religions are inferior to Buddhism and Taoism. . . . Western sciences have their ancient root in Chinese principles, which have been stolen and shrewdly expanded. . . . As to occidentals, their chaos has just begun to dissolve and their savagery has not yet changed. They have no loyalty, no family rules, no true principles of sexual relations, no literature, and no truly civilized society. . . . Because their land is narrow they have come to us searching the limits of the land for their own gain. . . . In the matter of skillful search into the secrets of the earth they are far shrewder than we, but they do this simply for gain, and are barbarians still, with all their industrial skill. . . . They seek only gain from our country; they aim to deceive our people, to surround our land, to disturb our national laws and customs."

It may be that the Empress Dowager is merely an opportunist; but it seems much more likely that she thinks to realize fully the dreams of these past three years and to close the "coup" of 1898 by which the reformer, Emperor Kwang Hsu, was set aside and six of his advisers beheaded by a general onslaught on all the "foreign devils" who are infesting her domain. The moderate members of the Tsung-li-Yamen, or Foreign Office, have been displaced by enemies of the foreigners. In one breath she condemns General Nieh for punishing the "Boxers" and calls them "good citizens," and in the next, to hoodwink foreign governments, she orders them to desist. The appointment of Yuan Shi Kai as governor of Shan-tung, though nominally in the interest of order, can now be looked upon as noth-

ing more than a temporary yielding to foreign demands while waiting for the proper moment for the present outbreak.

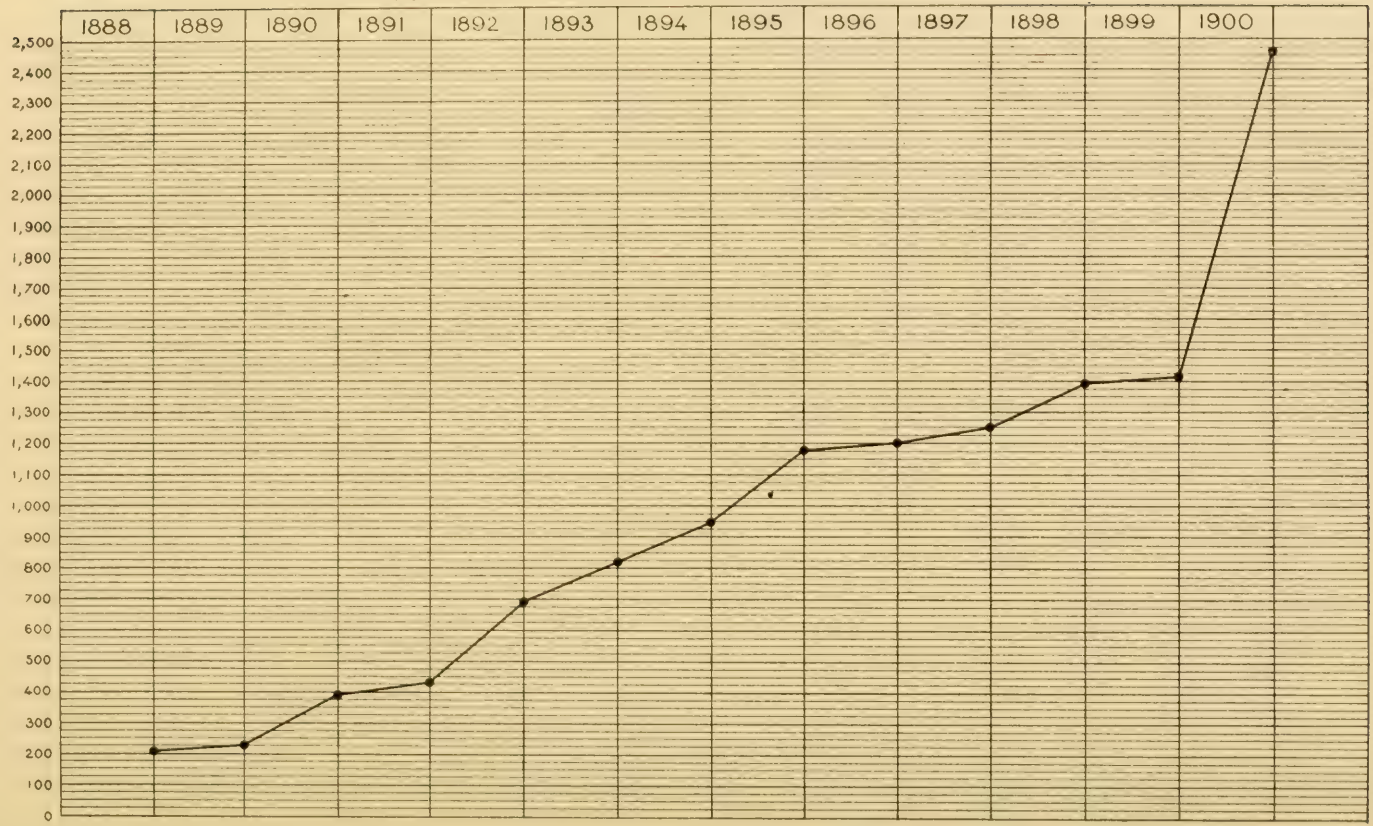
The anti-foreign outbreak has grown from what at first seemed but a plundering attack upon a few poor Chinese Christians in northwestern Shan-tung to proportions which necessitate international action and which threaten the very existence of foreigners and of foreign interests in China. It will not prove sufficient to quiet Pekin. With diplomatic relations restored, the Empress can, by retaining in the Foreign Office the anti-foreign ministers, wage a warfare of extermination on business and missionary interests throughout the provinces. The provincial officials would but carry out the secret edicts, while a corresponding series of pro-foreign edicts would tie the hands of consuls and foreign ministers.

I concur in the ideas expressed by Weng Tung Ho, tutor of the Emperor Kwang Hsu, and see but little hope of a satisfactory settlement of the present most deplorable situation outside some arrangement similar to that suggested. Weng says: "His Majesty is convinced, through amply trustworthy sources, that the loyal support of many scores of millions of Chinese will be accorded to his proposals for putting an end to the state of anarchy brought about by the action of the Empress Tsi An.

"The government of China, being virtually non-existent, the Emperor proposes that the foreign powers, whose troops dominate the capital, shall remove his imperial person from the palace in which His Majesty is confined a prisoner, shall declare Empress Tsi An and her present ministers to be usurpers, and shall bring Emperor Kwang Hsu to Nanking, Wuchang, or Shanghai, whichever the said foreign powers deem to be the most suitable situation for the new capital of the Chinese Empire under the new conditions. It is proposed by His Majesty and his advisers that the foreign powers should declare a joint protectorate and undertake the task of governing the country through His Majesty.

"China is ripe for the change of tide which the reactionaries vainly seek to stem. If it should be, on the other hand, that the foreign powers seriously contemplate the dismemberment of the Chinese Empire, they have before them the huge task of facing dense millions, who, although lacking training and making but contemptible soldiers, possess boundless powers of passive resistance, and would be able to wear out the patience of any European rulers seeking to govern them without regard to their prejudices."

MEMBERSHIP OF THE NATIONAL GEOGRAPHIC SOCIETY
FOR EACH YEAR SINCE ITS INCORPORATION



NATIONAL GEOGRAPHIC SOCIETY

It is probable that at the first meeting of the National Geographic Society next winter some very important modifications in the work of the Society will be recommended by the Board of Managers. These modifications are largely the result of the growth of the Society during the past year, as shown on the chart on the opposite page. Between June 1, 1899, and May 31, 1900, the membership increased from 1,417 to 2,462. This rapid growth can, it is believed, be continued by maintaining the earnest and persistent efforts that have been so effective during 1899–1900. In a few years the Society may hope to number thousands of members where it now has hundreds.

The most important modification contemplated in the organization or work of the Society is the unification of membership. Already the non-resident members outnumber those resident in Washington. It is now proposed to abolish the distinction between the two classes of membership and give all members equal privileges. Among other changes under consideration is the delivery of lecture courses in the various cities of the United States as nearly identical with those given at the Capital as may be practicable. It must be understood, however, that none of these changes have as yet been considered by the Society. They were earnestly recommended by President Alexander Graham Bell at the annual meeting in May, were unanimously approved by the Board of Managers, and have been referred to committees, who will form and submit to the Society plans for carrying them into effect.

GROVE KARL GILBERT

The striking portrait of Prof. G. K. Gilbert, which serves as the frontispiece to this number of the NATIONAL GEOGRAPHIC MAGAZINE, depicts more clearly than any words the strength and brilliancy of this eminent scientist. Mr Gilbert was born in Rochester, N. Y., in 1843, and graduated from the University of his native city at the age of 19. After several years as assistant geologist in Ward Museum, Rochester, he was appointed geologist on the Ohio Survey in 1868, later on the Wheeler Survey, and then on the Powell Survey. Since 1879 he has been on the U. S. Geological Survey. On the death of Dr Edward Orton he was elected President of the American Association for the Advancement of Science for 1899–1900. He is the author of "Geology of the Henry Mountains," "Lake Bonneville," etc., and many other valuable contributions to geological literature.

OUTLINE MAP OF THE FAR EAST

Port Arthur and Ta-lien-wan were leased to Russia March 27, 1898, for 25 years, but the duration of the lease may be extended by mutual consent.

Wei-hai-wei was leased to Great Britain July 1, 1898, for as long a period as Russia shall remain in possession of Port Arthur.

Kiau-chau was leased to Germany January, 1898, for 99 years.

Hongkong was ceded to Great Britain in 1841, a further concession on the mainland being made in 1861, and a lease for 99 years of an additional 200 square miles being granted in July, 1898.

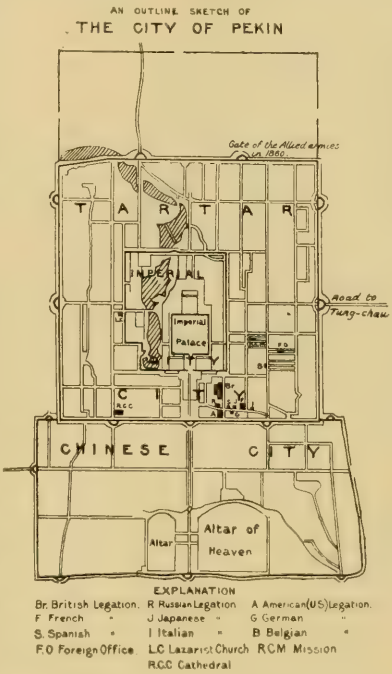
Kwang-chau-wan was leased to France in April, 1898.

The recent exclusive concession by Korea of a site for a coal depot and a naval hospital at Masampho has given Russia control of the finest harbor in southern Korea.

THE TSUNG-LI-YAMEN

The Board of the Tsung-li-Yamen, or Foreign Office, was created in 1861 to conduct all dealings with foreign nations and with foreigners. Of the character and working of the Board, Miss E. R. Scidmore, the Foreign Secretary of the National Geographic Society, relates the following in her book, "*China, the Long-lived Empire*," just published by the Century Company:

"Ministers have always a long, slow ride in state across to the shabby gateway of the forlorn old yamen, where now eleven aged, sleepy incompetents muddle with foreign affairs. As these eleven elders have reached such posts by steady advances, they are always septuagenarians, worn out with the exacting, empty routine rites and functions of such high office, and physically too exhausted by their midnight rides to and sunrise departures from the palace to begin fitly the day's tedium at the dilapidated Tsung-li-Yamen.

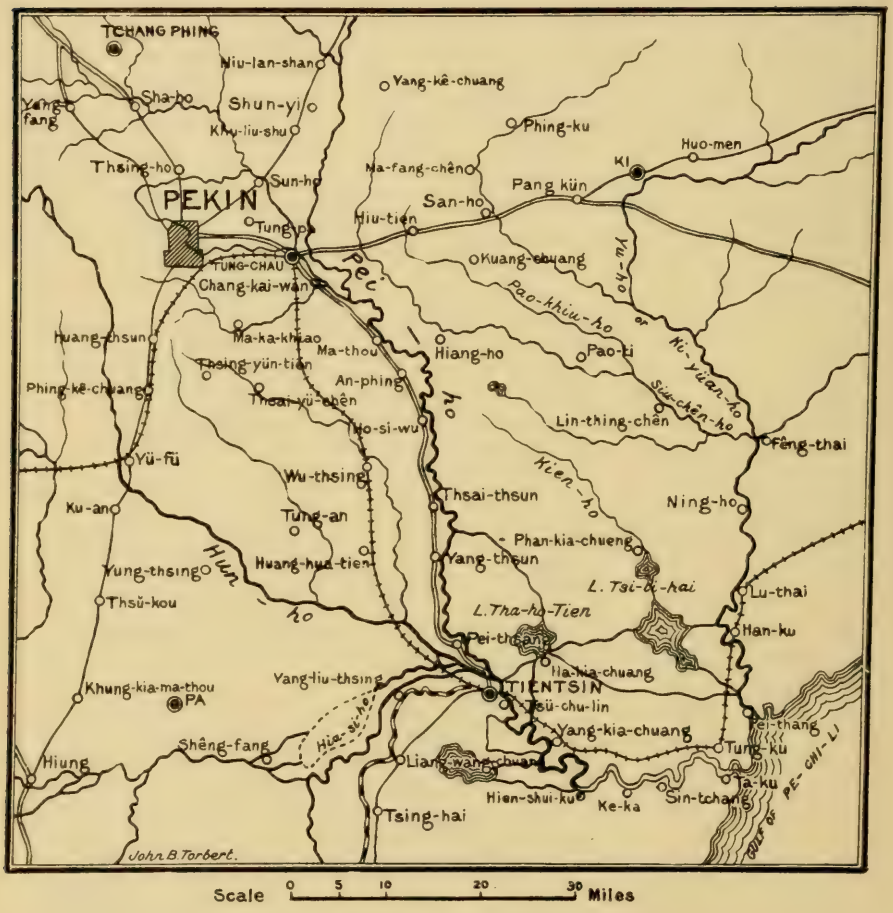

AN OUTLINE SKETCH OF
THE CITY OF PEKIN
Gate of the Allied armies in 1860.
T A R T A R
IMPERIAL
Imperial Palace
Road to Tung-chau
C I T Y
CHINESE CITY
Altar
Altar of Heaven
EXPLANATION
Br. British Legation. R Russian Legation A American (US) Legation.
F French " J Japanese " G German "
S. Spanish " I Italian " B Belgian "
F.O Foreign Office. LC Lazarist Church R.C.M Mission
R.C.C Cathedral

"The appointment for an interview with the non-committal, irresponsible Board must be made beforehand, the minister and his secretaries are always kept waiting, and the inner reception-room swarms with gaping attendants during an interview. Once the American Minister made a vigorous protest, and refused to conduct any negotiations while there were underlings in the room, and as it was business that the Chinese Government wished conducted, the minions were summarily cast out—cast out to the other side of the many-hinged, latticed doors, where they scuffled audibly for first places at cracks and knot-holes.

"The other envoys would not sustain the American protest, and soon the farce of the empty room was played to an end, and the servants came in with their pipes and fans, tea and cake and candies, as usual; stood about, commented on and fairly took part in the diplomatic conversations, as before.

"Every servant in a foreign establishment in Pekin is a spy and informer of some degree. Espionage is a regular business, and the table talk, visiting list, dinner list, card tray, and scrap basket, with full accounts of all comings and goings, sayings and doings, of any envoy or foreigner in Pekin are regularly offered for purchase by recognized purveyors of such news.

"Diplomatic secrets are fairly impossible in such an atmosphere. Every secret convention and concession is soon blazoned abroad. Every word the British Minister uttered at the Tsung-li-Yamen was reported to the Russian Legation with almost electric promptness, until the envoy threatened to suspend negotiations and withdraw. Wily concessionaries know each night where their rivals are dining and what they have said; whether any piece of written paper has passed, and what has gone on at each legation in Pekin and each consulate at Tientsin. Every legation keyhole, crack, and chink has its eye and ear at critical times, and by a multiplication in imagination one arrives at an idea of what the palace may be like."

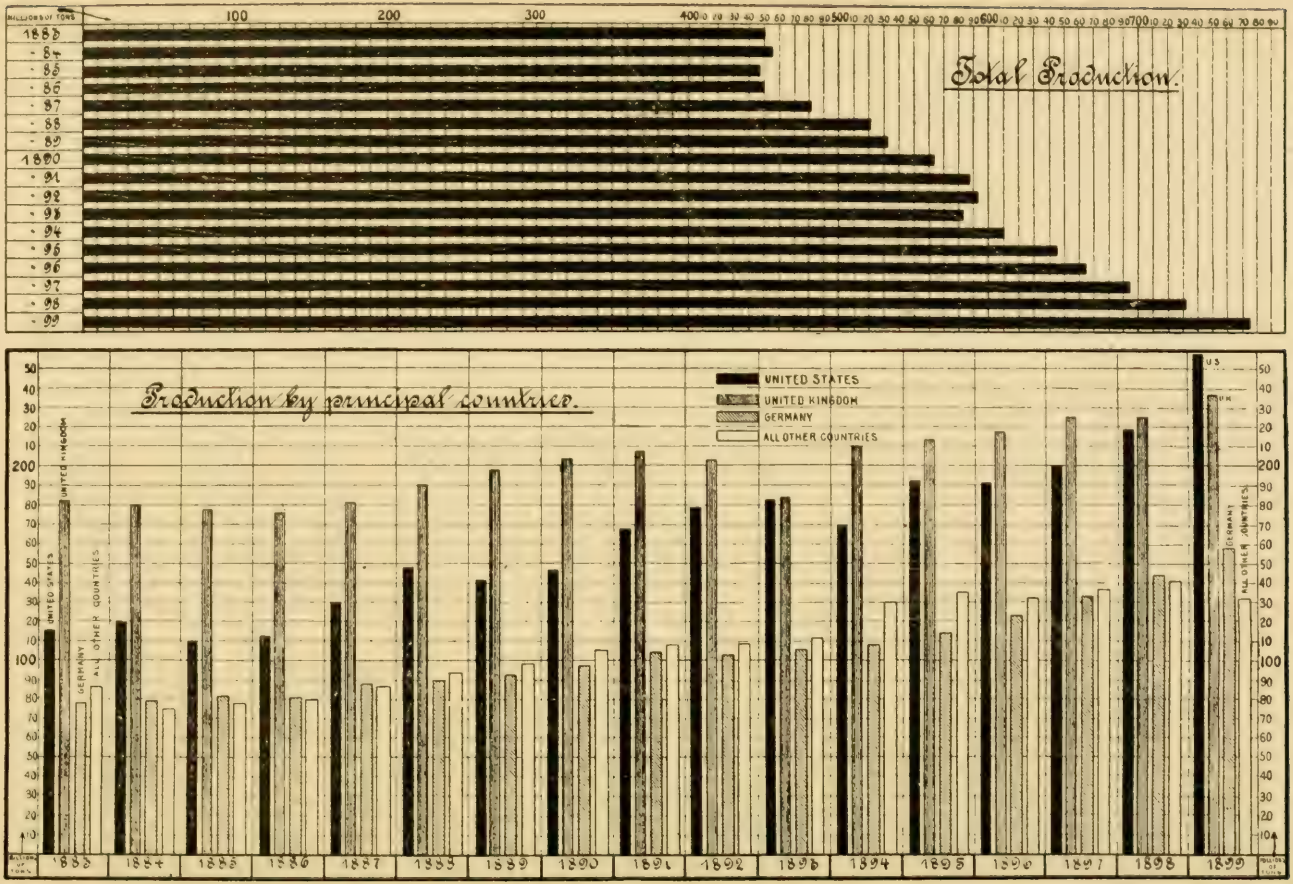


MAP SHOWING THE COUNTRY FROM TA-KU TO PEKIN

GEOGRAPHIC NOTES

Tientsin, the military key to Pekin, is at the junction of the Hun-ho and the Pei-ho, about 80 miles by road from the capital and 65 miles from Ta-ku. Gunboats and sea-going junks can ascend the river only as far as Tientsin. The foreigners live in three concessions—French, English, and German—bordering on the river and covering an area of several hundred acres. The English have a very handsome town hall, a well-kept public garden, and a recreation ground. The city has also two hotels, two clubs, a theater, an excellent public library, and three churches—Catholic, Anglican, and Union. Countless barges ply between Tientsin and Tung-chau, whence a wretched cart road of thirteen miles connects with Pekin. The railway between Tientsin and Pekin, completed in 1897, is now absorbing the larger part of this commerce. The population is now estimated at 950,000, and is increasing very rapidly, as Tientsin is the principal outlet for the trade of the provinces of Chi-li, Shan-si, Shen si, Kan-su, and the northern part of Ho-nan, which contain a population of about 100,000,000. In 1870 occurred the terrible massacre of foreigners, when the French Sisters of Mercy were brutally butchered.

"That the Russianization of China will eventually be accomplished seems inevitable. . . . With the conquest of China the 8,000,000 soldiers of the Czar, who compose the army of Russia when on a war footing, could be increased to 40,000,000 fighting men, most of whom could live inexpensively on a handful of rice a day. With such an army Russia could dictate terms to the world." This statement, by Alexander Hume Ford, in *Collier's Weekly*, is an opinion very generally shared by the press of the United States. However, two facts are here taken for granted which have yet to be proved. First, has Russia now the ability to subdue the four hundred millions of China, and, second, granted that she can subdue them, has she the capability of moulding them and keeping them subservient to her will? The military strength of Russia in Manchuria and on the Pacific Coast cannot be estimated, but it is doubtful if she could muster, at the maximum figure, 100,000 troops. That such a force can cope with restlessness in China, especially when communication is by road only, is impossible. Russia has her hands full in the development of the vast resources of Siberia; here millions of colonists must be absorbed before anything can be attempted in China. Meanwhile, notwithstanding fierce reaction, progress must inevitably go on in China, solidifying the masses of the people. It is a problem whether the national spirit of the Chinese will not be soon unified to such an extent as to be able successfully to resist Russia when she is ready to begin her "Russianization." It is argued that because Russia has been able to absorb and "Russianize" the nomadic and semi-nomadic tribes of central and northern Asia that she will be equally successful in dealing with the Chinese. But the handling of immense masses of population that have a grand past from which to gain individuality is quite different from overawing weak and scattered tribes.



THE WORLD'S PRODUCTION OF COAL, 1883–1899. PREPARED BY O. P. AUSTIN, CHIEF OF THE BUREAU OF STATISTICS, TREASURY DEPARTMENT

The output of coal in the United States in 1899 for the first time exceeded the output in every other country. The mines of the United States yielded 258,539,650 net tons of the total production of the world, 775,000,000 net tons, or more than one-third. The figures given in a recent bulletin prepared by Mr O. P. Austin, Chief of the Bureau of Statistics of the Treasury Department, show that the increase of production in Great Britain, though very great, is not keeping pace with that of Germany and the United States. The average annual rate of increase for the 30 years ending with 1897 was for the United Kingdom, 2.33 per cent, for Germany, 4.60 per cent, and for the United States, 6.64 per cent. Austria-Hungary, France, Belgium, Russia, and Japan, in the order named, are the next largest producers.

England has always maintained that Morocco, or at least that part of it adjacent to the Strait of Gibraltar, must remain neutral. It is now hinted, however, that she may assent to the acquisition by Spain of a slice of territory along the northern coast, allowing France to have the rest of the country, in case the partition of Morocco comes up for settlement within a year, as seems not unlikely. The French recently occupied Igli, on the border of Morocco and Algeria, and are said to be massing troops on the frontier—a proceeding that is naturally exciting the Moors, who are fiercely jealous of their independence and not easily controlled by the government. Under a good government Morocco might become one of the most prosperous parts of Africa. Her people show capabilities of much development. She has rich resources in iron, tin, and copper, and splendid forests of oak and pine, while her soil yields all the cereals of warm and temperate climates. The principal harbors are Tangier, on the Strait of Gibraltar, and Tetuan, on the Mediterranean. On the Atlantic coast there is no first-class harbor, though Rabat and Mogador are of some importance. The Spanish town of Ceuta occupies a narrow peninsula at the east end of the strait. The city of Morocco was founded nine hundred years ago, and during the thirteenth and fourteenth centuries was a famous seat of learning to which the Moors of Spain sent their children. Barely 50,000 inhabitants now represent the 100,000 houses and 700,000 people which it once boasted. In any proposed partition of Morocco the desperate resistance of six million Moors, Arabs, and Berbers will have to be reckoned with.

Three men are aiming for the North Pole this summer. The Duke of Abruzzi, after a winter of exploration in Franz Josef Land, planned to advance from that group of islands. This route to the North Pole is considered the

most difficult, as 500 miles each way, or 1,000 miles in all, have to be fought over ice and snow. The Italian prince is, however, of a splendid physique and an indomitable will, and he has with him the best equipped party that has ever started for the North Pole. (See NAT. GEOG. MAG., p. 362, vol. x, 1899.)

If Peary's plans have been successfully carried out, Cape Joseph Henry is now in his rear and he is sledding across the frozen sea ahead of Lockwood and Brainard's farthest north. This is Peary's third consecutive summer in the Arctics. Last year he passed in establishing a "road" lined with caches of supplies to Cape Joseph Henry, from which he was to make his dash this spring. (See NAT. GEOG. MAG., pp. 414, 415, vol. x, 1899.) The *Windward* sails early in July on the third of the series of annual reinforcements. She will be equipped for three years, so that Peary may keep her with him as long as necessary.

Sverdrup in the *Fram* is an unknown factor. His first year he accomplished little, as his ship was frozen in 50 miles to the south of Peary. It has been stated that he has given up his original ambition of gaining the Pole, and is confining his work to a careful exploration of northwest Greenland.

Robert E. Stein, with two companions, has passed the winter in Ellesmere Land, near Cape Sabine, where, it will be remembered, he was left by the Peary relief steamer last summer. Stein hoped to return this year on the Peary relief steamer, but, as the *Windward* will probably not return this fall, the chances are that his party will have to remain north another year. He may have already cast in his lot with Sverdrup, or later, when the *Windward* appears, he may join the Peary party.

G. H. G.

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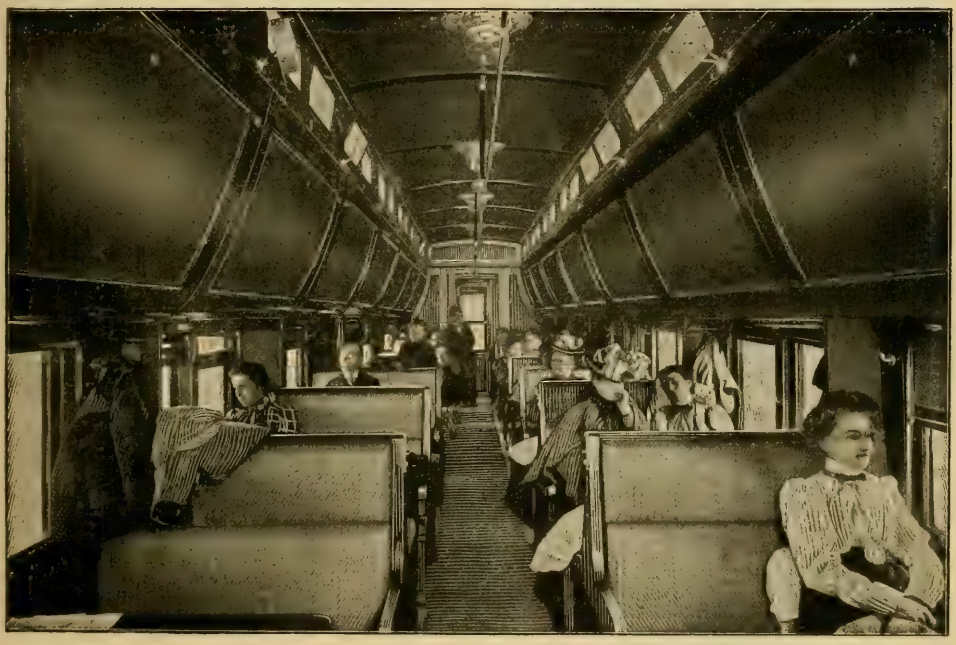

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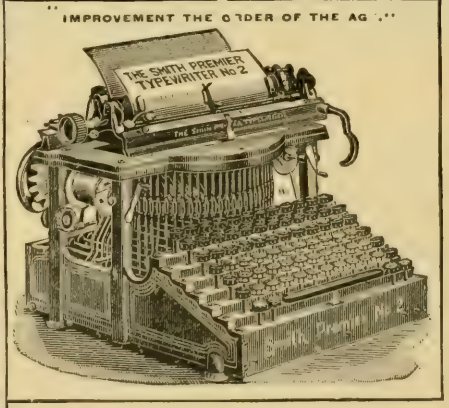

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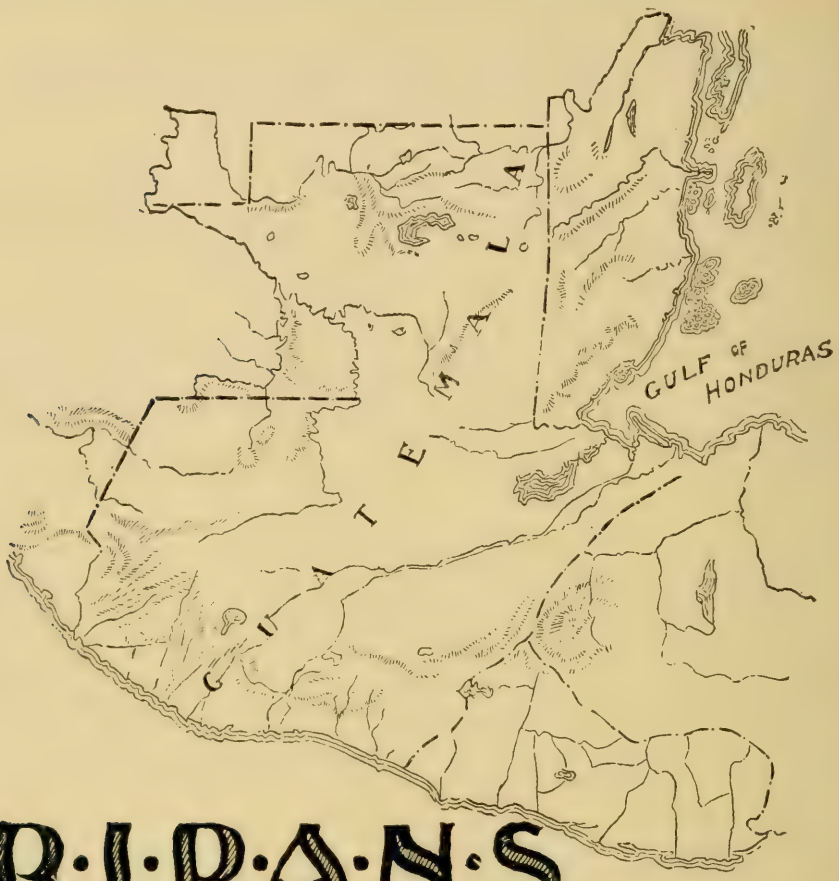

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Vol. XI AUGUST, 1900 No. 8

THE

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WASHINGTON
PUBLISHED BY THE NATIONAL GEOGRAPHIC SOCIETY

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Entered at the Post-office in Washington, D. C., as Second-class Mail Matter.

THE
NATIONAL GEOGRAPHIC MAGAZINE

VOL. XI AUGUST, 1900 No. 8

PROBLEMS IN CHINA

By JAMES M. HUBBARD

In 1724 the Emperor Yung-ching proscribed the Christian religion, which at that time had made great progress in China. Three Jesuit priests who were in Pekin addressed a petition to him, supplicating him to revoke his decree. Yung-ching summoned them to his presence, and in an argument of some length gave his reasons for his action, in which he disclaimed any disbelief in or hatred of Christianity. "You say that your law is not a false law, and I believe it. If I thought it were, what should hinder me from destroying your churches and driving you from the empire?" He closed with these words: "You wish to make the Chinese Christians, and this is what your law demands, I know very well. But what in that case would become of us? The subjects of your kings! The Christians whom you make recognize no authority but you; in times of trouble they would listen to no other voice. I know well enough that there is nothing to fear at present; but when your ships shall be coming by thousands and tens of thousands, then, indeed, we may have some disturbances."

This remarkable statement is interesting both as showing the intelligence and liberality of a Chinese ruler nearly two centuries ago, and also as being a concise statement of one of the principal causes of the present upheaval in China. Christian law demands an obedience which undermines and finally overthrows the authority of every other conflicting law. This fact the intelligent Chinese of today recognize more clearly even than did Yung-ching, and the vindication of the authority of Chinese law is the main object of the present conflict. The distinction between the two laws, the Christian and the non-Christian, leaving religious dogmas out of view, may be said to lie in the fact that Christian law demands obedience to these three principles: the right of every man, whatever his condition or station, to his

MAP OF
THE CHINESE EMPIRE
And
JAPAN
Showing
The provindes, treaty ports, railways etc.,
and
The present condition of the Russian Railway
through Manchuria to Port Arthur.
0 100 200 300 400 500 Miles
CENTRAL ASIA
(Russian)
SIBERIA
MANCHURIA
MONGOLIA
SUNGARIA
EAST TURKESTAN
KASHMIR
(British)
TIBET
INDIA
CHINA
PE-CHILI
SHAN-SI
SHAN-TUNG
KAN-SU
SHEN-SI
HO-NAN
KIANG-SU
HU-PEH
SZE-CHUEN
KUI-CHAU
HU-NAN
KIANG-SI
CHE-KIANG
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CHINA SEA
PACIFIC OCEAN
PHILIPPINE ISLANDS
Irkutsk
Stryetensk
Merchinsk
Orchon
Blagovetchensk
Khabarovsk
Gulf of Tartary
Mergen
Khalar
Tsitsikar
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San-sin
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Mukden
Chang-tu
Broughton Bay
Gensan
Seoul
Chemulpo
Tientsin
Taku
Gulf of Pechili
Port Arthur
Talien-wan
Wei-hai-wei
Chefoo
Tang-chau
Chi-fu
Pao-ting
Tai-yuan
Tsi-nan
Kiao-chau
Yellow River
Lan-chau
Tsin
Singan Fu
Kai feng
Han-cheng
Nankin
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Hang-chau
Ning-po
Kui-chau
Han-kau
Wu-chang
I-chang
Sha-shi
Yu-chau
Kiu-kiang
Poyang L.
Shao-hing
Chingtuo
Shun-king
Ta-tang
Kia-ting
Chung-king
Su-chau
Ning-yuan
Yang-ning
Li-kiang
Chang-sha
Siang-tan
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Ki-an
Yen-ping
Fuchau
Lien-kiang
Kan-chau
Ting-chau
Tam-sui
Kilung
Tauan-chau
Amoy
Chang-chau
Kiu-tsing
Yun-nano
Meng-tsze
Mandalay
Sz-mien
Lung-chau
Pakhoi
Koa-chau (Fr)
Kwang-chau-wan (Fr)
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Gulf of Tonkin
Kiung-chau
HAINAN
Swatow
Chao-chau
San-shui
Fachan
Wuchau
Macao (Port.)
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Lappa
CANTON
Formosa Strait
Taiwan
Takow
Tainan
Lucknow
Cawnpore
Allahabad
Ovatung
Railways constructed
Railways in process of construction
Treaty ports
Great wall of China
Grand Canal
Tientsin
John B. Torbert.

life and to his property and the inviolability of a promise—the sacredness of the truth. Non-Christian law is practically a denial of the authority of these fundamental principles. It is not meant by this statement to affirm that there have not been in the past and that there are not now many men in China who are just, upright, humane, and strictly honest. It is an indisputable fact, however, that human life has little value in that country; justice is almost unknown in the courts, and there is no respect for the truth—a promise is kept only when self-interest makes it worth while. Now, a conflict is inevitable when two civilizations founded on such antagonistic principles come into close contact, and its ultimate cause will be found to be the assertion on the one hand, the denial on the other, of one or all of these principles. Here, again, there is not the slightest intention of maintaining that in all the relations of China with the western powers, when disputes have arisen, she has always been in the wrong, they always in the right; but it is meant simply that the cause or pretense of every aggressive act on the part of the powers has been either that a foreigner's life has been taken, his property alienated or destroyed, or the terms of a treaty or concession have not been faithfully observed.

The incident which was probably the immediate cause of the Boxer rising—the murder of two German missionaries by a mob—is a typical one. From the western point of view it was only just and reasonable that first the magistrate of the town or district where the outrage occurred, then the ruler of the province, and lastly the government in Pekin should be held responsible for the death of these two men. We may justly condemn the method which Germany pursued to secure reparation for the deed; but this does not alter the fact that she was right in her original contention that satisfaction should be given for the taking of the lives of her subjects, and that she would have failed in her duty if the outrage had been suffered to pass unnoticed. From the Chinese standpoint, however, nothing could seem more unreasonable, more absurd, than the demand that the governor of Shantung should be punished because two insignificant men were murdered by a mob, whose deed possibly he did not justify and could not have prevented had he so desired. This German demand would naturally seem to them the mere arbitrary exercise of power, with the ultimate purpose of conquest, not the fulfillment of a sacred duty.

Fertile in international disputes, sometimes leading to war, have been the commercial treaties concluded with the powers, and the

railway, mining, and other industrial concessions granted to foreigners. There is no contention that these have always been in the interest of China. In one notorious instance—the forcing her to admit opium—it was certainly not the case. But the universal experience has been that when it has seemed to be for the interest of China to evade the rights granted under the treaties, or to make the concessions valueless, she has done so, often bringing great losses to individuals who have trusted in her promises. The interior navigable waters, for instance, were made free to foreign vessels in the summer of 1898, and large sums were spent in fitting out craft for this traffic; but when, on reaching China, an attempt was made to employ them the authorities put such obstacles in the way that this "concession" became a dead letter. They justified their action by the contention that it was in the interests of the river boatmen, whose means of livelihood would be taken away by the introduction of foreign steamers, which was no doubt true to a great extent.

This, then, is a principal cause of the present conditions in China. It is the mutual hostility of two distinct and diverse civilizations brought into intimate relations. In the one rights are maintained which seem to the other no rights—an obedience to a fundamental law demanded whose authority the other does not recognize.

Another, and possibly as significant, a cause is to be found in the fact that resistance to a ruler "so soon as he ceases to be a minister of God for good" is incumbent on every Chinaman. "This sacred right of rebellion was distinctly taught by Confucius, and was emphasized by Mencius, who went the length of asserting that a ruler who, by the practice of injustice and oppression, had forfeited his right to rule, should not only be dethroned, but might, if circumstances required it, be put to death." For two hundred and fifty years the Chinese have been the subjects of Manchu or Tatar sovereigns, alien to them in race and disposition. Nomads by descent, these emperors of the present dynasty have retained some of the barbaric characteristics which distinguish a pastoral from an agricultural and commercial people such as the great mass of the Chinese are. Their single aim has been, not to develop the resources of the empire, but to consolidate and strengthen their power. One result of their methods of government is the prevalence of official corruption to an extent previously unknown. The principal officers of the provinces are appointed for three years only, to prevent their gaining an undue and dangerous influence. The chief duty of the governor with rela-

tion to the emperor is to send an annual tribute to Pekin, upon the size of which depends his favor at court. Naturally his one object during his short term of office is to extort as much money as possible from his unfortunate subjects, and his example is imitated by all his subordinates down to the lowest magistrate. Now, it has been perfectly evident to all intelligent Chinese that as their government has grown more corrupt it has become weaker. Its weakness has never been demonstrated so clearly to them as in the latest times, in the ignominious defeat by Japan, the absolute inability to resist the occupation of Chinese territory by the German, Russian, English, and French powers. Here are conspicuously, then, the conditions which make it the duty of a faithful disciple of Confucius to rebel against his ruler: injustice, oppression, and incompetency.

Added to this impulse to revolution is his unfading memory of a glorious past when China was under the guiding care of sovereigns of his own blood. It has only needed at any time in the last century a leader of ability and a definite cry to cause the discontented people to break into open revolt. Such a leader fifty years ago was Hung-siu-tsuen. The founder of a "Society of the Worshippers of God," he proclaimed "himself as sent by heaven to drive out the Tatars and to restore in his own person the succession to China." Multitudes flocked to a standard raised "to extirpate rulers who, both in their public laws and in their private acts, were standing examples of all that was base and vile in human nature." Hung-siu-tsuen defeated the imperialist forces sent against him, and in 1853 he stormed the great city of Nankin. Here a native Chinese Taiping dynasty was inaugurated, of which he was the first emperor, assuming the title of Taïping Wang, King of Great Peace, or Heavenly King. Subordinate aims were the destruction of idolatry and the prohibition of opium.

It was in its origin a religious and temperance as well as a national movement. This is not the time to discuss the causes of its rapid degeneracy and final overthrow, in 1864, by General Gordon, nor the strange blindness of the western powers to its distinctively Christian character. The Taipings, for instance, based their moral teachings on "The Ten Words" of Moses. They observed the "Lord's Day" and printed and distributed thousands of copies of translations of Genesis, Exodus, and St Matthew, as well as Christian devotional works. "The temples were burnt and thrown down," says an English eye-witness, "and not a whole image was to be seen in city or country

BUDDHIST PRIESTS — AMOY

From Commander Harrie Webster's collection of Chinese pictures

POLICE COURT — SHANGHAI

From Commander Harvie Webster's collection of Chinese pictures

for hundreds of miles." Had the powers given the movement their support, it is not impossible that the pure and high aims and motives with which it began might have been maintained. In that case there can be little doubt that the Taipings would have taken Pekin, and that a new era of peace and prosperity might have opened for China.

This conviction of the wickedness of their present rulers, whether judged by Confucian or Christian standards, has not decreased in strength during the last half-century. Many causes, on the contrary, besides those political ones already mentioned, have contributed to make it stronger today in multitudes of Chinamen than ever before. It is by no means impossible that the Boxer rising, with its watch-word of "China for the Chinese," was originally a nationalist movement for the overthrow of the Tatar dynasty, as well as for the driving out of foreigners and the extirpation of Christianity. But the influences which led primarily to the Taiping rebellion have increased tenfold in force since 1850. Education of the western type has been extended to tens of thousands in all parts of the empire. A literature, both religious and secular, setting forth the principles on which western Christian civilization is founded and familiarizing the Chinese readers with Christian ideals of life and character, has been created. The intercourse with travelers, merchants, officials, and missionaries, together with the not inconsiderable number of Chinese who have visited our countries and returned to tell of what they had seen to their countrymen, has spread broadcast a more or less definite knowledge of the outside world.

The natural outcome of all these influences has been the birth of a reform party which increased in strength with such rapidity that, having gained the ear and confidence of the Emperor, it seemed but just now to be on the point of revolutionizing the ancient methods of government and education. Its principal aims are shown in the famous seven Reform Edicts issued by the Emperor in the spring of 1898. These provided for the building of railways; the abolition of the old essay system of the civil service examination and the substitution of western learning; the turning of unused temples into schools for instruction in this learning; the establishment of a great university in Pekin; the organization of a bureau for the translation of western literature into Chinese; the foundation of a patent office, and the protection of foreigners and especially missionaries. Although this strenuous, though possibly ill-timed and too sweeping, effort for reform disastrously failed, the leaders being executed or flying from

the country, yet the influences which called it into existence remain. Doubtless the events of the past few months will have increased rather than diminished the number of its open or secret adherents.

These are then, in my opinion, the principal causes of the present outbreak in China, whose ultimate consequences it is impossible for the wisest of us to foresee. It is the inevitable conflict of two essentially diverse civilizations brought into close contact. It is also the result of conditions due to a long succession of weak and corrupt rulers. These appear to me to include all special causes, both religious and political. Though the outbreak was directed apparently at first against Christian missionaries and their followers and is now for the moment a life and death contest with all foreigners, yet hatred of Christianity cannot be attributed to the Chinese as a people. Their indifference to all religion is a national characteristic. There is no question but that their superstitious fears have been often awakened by the desecration of ancestral graves through the construction of railways, by the erection of churches with high towers, and by the refusal of native Christians to join in some religious rite considered essential for the common welfare, as to avert a drought or heal a prevailing sickness.

It is more than likely, it is certain, that many good but over-zealous missionaries have unnecessarily aroused opposition through lack of tact and prudence in attacking customs and beliefs which ages of existence had made sacred. The Catholic priests especially have incurred heavy responsibilities by their claim to sit as magistrates with the mandarins in cases in which the interests of members of their flock were at stake. The motive for obtaining the privilege was a good one, to secure justice, but the result has been in many instances disastrous.

The often-repeated saying, "First the missionary, then the consul, then the general," rests on an undoubted basis of truth. The missionary no sooner gains a foothold in any land than he is closely followed by the trader of his own or some kindred nationality. He in his turn brings after a time the consul, his government's representative to protect his interests, and with the consul comes a guard which circumstances may change into a conquering army. This is a natural, an almost inevitable, sequence, and one that abundantly justifies the Chinese suspicion that the original coming of the missionary is simply to prepare the way for the general. The history of Protestant missions, we do not say Catholic, bears triumphant proof, however,

of the falsity of the assertion of such a motive in endeavoring to Christianize a heathen people.

What is to be the end of the contest now being waged in northern China? To this question there is but one answer that can be made with any degree of confidence. Pekin must fall into the hands of the allied powers. Whether or not the present rulers of the country will be captured with it remains to be seen, though all the probabilities are against it. But if they fly to the ancient Chinese capital, Singan Fu, in the province of Shensi, 750 miles inland, and set up the government there, what then? In other words, can the powers, either unitedly or singly, conquer China or any considerable part of it not adjacent to the sea? If the Chinese are united in their opposition to the powers, I believe this to be an impossibility from the physical character of the country and the number and disposition of the people.

China proper—that is, excluding Mongolia, Manchuria, Tibet, and Turkestan—is, in round numbers, 1,500 miles in extent from east to west and 1,400 miles from north to south. It is, roughly speaking, divided into three great river basins, which are separated from each other by ranges of mountains. The northernmost is that of the Yellow River and consists in large part of a plain, subject to terrible inundations from the fact that it lies below the level of the river, which now and then bursts its banks and makes for itself a new channel. It is unnavigable and apparently would afford no aid to an invading army. This is not true of the second or Yangtze River, which is navigable for nearly 2,000 miles and has numerous tributaries navigable for small craft. This is the richest part as well as the most populous of the empire. The deltas of these two rivers are connected by the Grand Canal, formerly a great avenue of trade, upon whose banks were important cities. Sections of it are now in ruins, and even if it were in good repair it runs throughout its entire length so near the coast as to be useless to an army invading the interior. The third river is the West, in the extreme southeastern part of China. It is navigable for some 200 miles and would give access only to two provinces, only one of which, Kuangtong, is of any importance.

These river basins were formerly connected by imperial roads, constructed before the Tatar conquest, and even in their ruins excite the admiration of travelers and attest the height to which Chinese civilization once reached. The present rulers have suffered them to fall into decay and comparative disuse, as rapid and easy communication between the different parts of the empire was considered dangerous,

SAMPLING TEA — SHANGHAI

From Commander Harvie Webster's collection of Chinese pictures

as affording a discontented subject people opportunities to combine against their rulers. It will be evident that to march armies sufficiently large to subdue 400,000,000 people through such a country—armies almost all of whose munitions of war would have to be transported from the coast—would be a physical impossibility.

Then the Chinese, when hard pressed, are capable of using means of defense against which the best equipped European armies, led by the ablest generals, would be as powerless as if they were naked savages. On one occasion the inhabitants of the northern province of Honan, being unable to meet an invading army in the field, "cut through the dikes of the Yellow River, 'China's Sorrow,' and flooded the whole country." The invaders escaped to the mountains, but upward of 200,000 natives perished in the flood, and the city of Kaifeng was destroyed. Another time, "in the first period of the Manchu dynasty, the Chinese had the patriotism and resolution to lay waste their own coasts as far as twenty leagues up the country, and destroy villages and cities, burn woods and cornfields—in fact, to create an immense desert—in order to annihilate the power of a formidable pirate, who for a long time had held in check the whole strength of the empire." What this extraordinary people have done more than once in their stress they would do again under similar circumstances.

But are they united and animated by the single desire of driving out the "foreign devils"? It does not seem to me that there is any evidence of this other than the mere assertion of writers who have apparently taken it for granted. A united purpose impelling the ignorant myriads of Chinese, divided in speech and in habits of life and separated by vast distances, is inconceivable. Hatred of the foreigners is, I believe, in large measure confined to the ruling classes, whose powers and privileges are threatened by the new religion and the reforms which it brings with it. The Chinese magistrate who sells justice to the highest bidder naturally hates the consular court. It is they and the literati, or educated class, from whose ranks they are drawn, who foment these disturbances; who placard the cities with inflammatory invitations to rise up against the foreigners; who circulate scandals about the Christian rites, similar to the assertions made and believed in France and Austria about the Jews. That they are able to arouse the common people to action here and there, especially in the coast provinces and in large cities and their neighborhoods, recent events have proved. It is possible, but hardly conceivable

that they could do the same throughout the empire, for it should be remembered that there are still great districts, inhabited by millions of people, into which missionaries have never gone and through which foreign travelers rarely, if ever, pass. At present I am convinced that the great mass of the people throughout China are ignorant of what has taken place at Pekin and Tientsin; they are indifferent as to who rules over them, provided they are left in peace to till their fields and reap their harvests.

Does the western world need China, and, reciprocally, does China need intercourse with the Christian nations? Many persons question seriously whether we ought to force, as it were, our civilization, our commerce and manufactures, our modes of government, our literature and religion, upon an unwilling people, the mass of whom are probably as well off materially as the mass of the people of Europe. They are probably better off than the Russian peasants. The accounts of some travelers lead one to believe that in some parts of the province of Szechuen the inhabitants surpass all other peoples in their apparent prosperity and contentment. Why should we come and disturb this peace? In answer it is only necessary to say that the commercial and religious invasion of China by the western nations is a part of the progress of the world. China is no longer at a distance from us, but is the near neighbor of Russia, England, France, and the United States. She is one of the great nations of the world, and mutual intercourse between her and them is inevitable. Its advantages, even from the lowest material point of view, are not all on one side. Her foreign commerce, amounting to nearly $300,000,000 annually, not only pays a third part of the expenses of the central government, but enriches her merchants, tea cultivators, and the raisers of silk as much as it does our manufacturers of cottons. And this commerce is but a small fraction of what it will be when her vast virgin fields of coal and iron are exploited and the whole empire is thrown open without restriction to all who desire to enter.

CHINA AND HER PEOPLE—SOME REFLECTIONS ON THEIR MANNERS AND CUSTOMS, HABITS, AND LIVES

By Commander Harrie Webster,

United States Navy

The geographical boundaries of China proper, that huge Mongolian Empire, about which the world is now so deeply concerned, are: on the north, Mongolia, from whence, at irregular intervals in the past, have come those overwhelming currents of humanity which have modified in a remarkable degree the race characteristics of the Chinese; on the east, the great Gulf of Pechili, the Yellow Sea, and the Pacific Ocean; on the south, the China Sea, the Gulf of Tonkin, Tonkin, and Siam; and on the west, Upper Burma and Tibet. Some writers, notably Wells Williams, the well-known author of "*The Middle Kingdom*," divide China proper into three portions—the mountainous, the hilly, and the level country. Employing this system, we find more than half of the whole area is mountainous, and lies west of a north and south line passing through the city of Wuchang, in the province of Hupeh. The hilly portion lies east of this same line and south of the great Yangtze River. The great plain or level country comprises the remaining part of the empire, and forms the northeast portion. The agricultural wealth of the nation lies in the level country.

China is divided into eighteen provinces, each of which is governed by a viceroy, who administers the affairs of his province nominally under instructions from Pekin, but actually in accordance with his individual ideas. During the progress of ages the spoken language of these provinces has undergone such modifications that it is practically impossible for a traveler to understand or be understood outside the borders of his own province. The partial exception to this rule is the Cantonese. The spoken tongue of the province of Canton, or Kuangtong, as it is pronounced by the natives, appears to be the parent speech of a large part of China, so that today a native of Kuangtong can make his way with more or less ease from one end of China to the other. A witty Chinese gentleman once said to the writer at a native dinner in Shanghai, "With two languages, a man may travel all over the world. Knowing the Kuangtong dialect, he

may travel all over China, and with English he can make his way over the rest of the world." The written language, however, is practically alike for all portions of the empire, and the educated Chinaman can make his wants known with brush and paper in any part of the kingdom.

The two rivers flowing through the Celestial Empire with which the world is most familiar are the Hoangho, or Yellow River, and the Yangtze. The first is frequently called by Chinese writers "The Sorrow of China," on account of its frequent and disastrous inundations. Rising in Kuku-nor, it enters the province of Kansu, and passes the ancient city of Lanchau, capital of the province, eight hundred miles from its source. Flowing along, parallel with the Great Wall for five hundred and thirty miles, it passes beyond the borders of China into Mongolia. Reëntering the Flowery Kingdom between the provinces of Shensi and Shansi, forming their boundary, the river, increasing in size as it flows, strikes eastward to the sea through Honan and Shantung, passing the walls of Kaifeng and Tsinan in its course. In former days the Yellow River, after passing Kaifeng, flowed still farther to the eastward, through the province of Kansu, sweeping into the Pacific Ocean some hundred miles north of Chinkiang, on the Yangtze.

The great Yangtze rises in Tibet, and after flowing more than a thousand miles through a thinly populated country passes into China near Batang, in the province of Szechuen. At this point it is locally known as the "Kinsha," or River of the Golden Sand. Flowing from here south and east, it forms the boundary between Szechuen and Yunnan, receiving a large tributary, the Kialing, from the north. Passing through the province of Szechuen and past the walls of Chungking, the river enters the populous province of Hupeh and rushes through the magnificent gorges to Ichang. Hankau, Wuchang, and Hanyang, at the confluence of the Han River with the Yangtze and the head of deep-water navigation, are passed, and from here, skirting the northern extremity of Kiangsi Province, at Kiukiang, near the mouth of the celebrated Poyang Lake, the river strikes northeast, entering the province of Kiangsu near Nankin, the ancient capital. After intersecting the Grand Canal at Chinkiang, the Yangtze discharges its immense volume of water through two magnificent deltas.

The canal system of China is the most extensive in the world, with the possible exception of that of Holland. Wherever the lay of the

A TYPICAL CHINESE VILLAGE AND CANAL

From Commander Harrie Webster's collection of Chinese pictures

land permits, the thrifty native has made a canal. Thus he is enabled to carry the products of his labor to a market with the minimum of expense. It must be acknowledged, however, the process is carried out with the expenditure of the maximum of time. The waterways range in size from the Grand Canal, hundreds of miles in length and navigable by deep-water junks, to the little "neighborhood" canal of barely sufficient width for two sampans to pass each other. They serve not only the purposes of navigation and, in place of roads, for trade and commerce, but also as local fish preserves, as breeding pools for water-fowl, and for laundry purposes. In most of the canals there is more or less current, so they are not the menace to health that is generally supposed.

There are 31 "open ports" or "treaty ports" which by various treaties with the government are open to the traders of all nations. No passport is necessary to enter these cities; but the prohibition against travel outside the free zone is strictly enforced. The free zone extends to the walls of the city, and the curious traveler ventures beyond at his own risk. Notwithstanding the fact that these ports are open to the commerce of the world, Great Britain is about the only nation which enjoys the full intent of the various treaties and conventions on the subject. This is especially true of the rich and populous towns of the Yangtze Valley.

The present Emperor of China, Kuangsü, is the son of Prince Ch'un, the seventh son of the Emperor Tao-kuang. He succeeded his cousin, the late Emperor Tung-chi, who died childless January 12, 1875, of smallpox. The proclamation announcing the accession of Kuangsü was as follows:

"Whereas His Majesty the Emperor has ascended upon the Dragon to be a guest on high, without offspring born to his inheritance, no course has been open but that of causing Tsaitien, son of the Prince of Ch'un, to become adopted as the son of the Emperor Wen-tsung-hien (Hien-fung), and to enter upon the inheritance of the great dynastic line as Emperor by succession:

"Therefore let Tsaitien, son of Yih-huan, the Prince of Ch'un, become adopted as the son of the Emperor Wen-tsung-hien and enter upon the inheritance of the great dynasty as Emperor by succession."

The present Emperor is the ninth sovereign of the Manchu dynasty of the Ta-tsing (Sublime Purity), which supplanted the dynasty of Ming in 1644.

There exists no law of hereditary succession to the throne, but it is left to each sovereign to appoint his successor from among the members of his own family. The late Emperor, dying suddenly in

his eighteenth year, did not designate his successor, and it was in consequence of palace intrigue, directed by the Empress Dowager, in concert with Prince Ch'un, that the infant son of the latter was declared Emperor. The Emperor Kuangsü, now in his twenty-ninth year, nominally assumed the reins of government in March, 1887. He married Ye-ho-na-la, niece of the Empress Dowager, February 26, 1889, and was enthroned in March, 1890.

The Emperor is the spiritual as well as temporal sovereign, and as high priest of the empire can alone perform the great religious ceremonies. No religious hierarchy is maintained at public expense, nor is any priesthood attached to the Confucian or state religion.

A characteristic of the Chinaman is his desire for education. So thoroughly imbued is the national spirit with the thirst for knowledge that it is safe to say that no other people are so generally and so well educated as the Chinese. Every boy is compelled by law to attend school a certain period of the year. Among the poorest classes, where the struggle for existence is fierce and unrelenting, among what are known as the coolie class, scarcely an individual can be found who cannot read and write, and this, too, not haltingly and with difficulty, but freely and, so far as can be understood by an observer, accurately and understandingly. The word "coolie" is not a term of reproach, but signifies laborer or workman, and is used among the Chinese themselves with this meaning. As in other parts of the world, the coolies or laborers are recruited from the lowest strata of the body politic; but, as has been pointed out, practically without exception they read and write their own complicated language.

During a recent cruise in Chinese waters I became much interested in noting the manner in which the lowest classes acquired their ability to read and write, and the result of several years of observation is that their education comes largely through the steady and persistent use of the stray minutes of life. As soon as a piece of work is done, while waiting for a fresh job, or even standing in line, waiting his turn to deposit his package, bale, or cask, the coolie plays with a stick or bit of bamboo, writing a character over and over, or studies a few characters written on a bit of paper brought from a pocket. Thus the minutes of waiting are employed in the acquisition of one more tiny bit of knowledge.

In physical appearance the natives of China vary widely from extreme north to south. While our experience in the United States leads us to think the race is small and undersized, a brief residence

in the northern provinces of the empire will go far to dispel this impression. At Chifu, Taku, and Tientsin one is struck by the stalwart appearance and height of the natives. At the first-named port large numbers of the men are six-footers, and among the boatmen of Chifu it is no uncommon thing to see a native over six feet in height, weighing nearly or quite two hundred pounds. In the south, however, the average is more nearly accordant with specimens we encounter as laundrymen, gardeners, and "coolies" generally in the United States. The well-known queu or pigtail by which Chinamen have become so well known is the visible mark imposed by their Manchurian conquerors in 1644. Notwithstanding the length of years since the imposition of this mark of subjection, there are large numbers who resent the queu. At Swatow the singular spectacle is presented of Chinamen wearing turbans! Unable to avoid shaving their heads and plaiting their hair in accordance with the Tatar edict, these people conceal the marks of their degradation beneath a veritable turban, fashioned closely after the Arabian model. It presents a curious anomaly in a country so thoroughly controlled by precedent and tradition.

The singular usages and customs of the people of China have been the wonder and comment of other and younger parts of the civilized world for many centuries. The general trend of such comment has been astonishment at the unusual manners and methods prevailing among the millions of the yellow subjects of the Son of Heaven. In clothing, style of living, care of children, amusements, and in many other points the Chinaman is different from the rest of the world. This view, however, is not quite a correct statement of the matter. The Chinese methods undoubtedly antedate western methods, and so, logically, the Chinaman, having adopted a certain manner of living, has the prior right to the system, and variations from his system should be counted singular. I am well aware this method of argument is not the usual one, but it is certainly the most logical. Those of the East naturally take this view, and express surprise that so many things are "done the wrong way" by their western brothers.

Intimate contact with the civilization of China impresses the observer with the conviction that nearly all their methods are the results of long experience, a survival of the fittest in pretty nearly every branch of human needs and conveniences. One feels that the experimental stage has long since passed away. A different way of doing a piece of work does not enter the mind of the Chinese operator

for the reason that *all other methods have been tried and the present one is the survival!* The claims made by the Chinese of priority in the use of many articles and methods are not infrequently well taken, and the writer has often been surprised in observing the common use of articles and their methods of manufacture which in other parts of the world are novelties or inventions of comparatively recent date.

The opposition of this nation to machinery is well known. It exists not only among the presumably ignorant who labor for their daily support, but among the rich and highly educated as well. The reason for this opposition is founded upon social and economic conditions unlike those in any other part of the world.

The Statement is as follows: First, every man in China is a worker, and only by untiring industry is he capable of feeding and clothing himself and family.

Second, all branches of industry are full. There is never lack of labor nor of work to do, and so nicely adjusted have become the economic conditions through centuries of struggle that practical content reigns among the workers, and any upsetting of the equilibrium of supply and demand produces widespread distress.

The Proposition.—Introduce a machine which shall, by the supervision of one man, be able to do the work of ten men.

The Result.—Nine men are thrown out of that particular task. There is no outlet for their industry for the reason given in paragraph 2 of the Statement. Therefore these nine men must starve, steal, or emigrate. From my observation this is pretty nearly the correct status of the working world in China and is the underlying reason for the opposition to labor-saving machinery. In this great empire a labor-saving tool or machine is an economic curse, and will remain so until the conditions are greatly modified throughout China.

It is to be understood, however, that this argument applies altogether to existing industries rather than to new forms of production and labor. The strength of Chinese performance consists in the interminable application of minute effort at a given point. In other words, the application of manual labor will, in the long run, carry out any task, however great, and in the doing the man earns his bread by the sweat of his brow. *From his point of view* he has no reason for discontent. He is therefore industrious, frugal, and probably happy. In China, the Chinaman is a good citizen.

Trade-unions for mutual protection are prevalent here to an extent undreamed of outside the Flowery Kingdom. Naturally the

outsider cannot know much of the details of these organizations, but the foreigner's experience will soon tell him the uselessness of contesting the action of any guild or workman's union whose members refuse to work for him. Without excitement or any evidence of dissatisfaction, the coolies working for the foreigner will strike, and no trouble will ensue because of attempts of others to fill the vacant places, as there are no applicants, and the work under way will simply remain unfinished until by mutual agreement the point in dispute has been settled. Strikes in China are seldom disorderly, and the boycott feature is never in evidence.

The question is often asked, How does the education of the better class compare with the educational attainments of a similar class in the United States? This is a very difficult question to answer, and to give a clear explanation would take much time and space. The education of the Chinese boy begins as soon as he can think, and is pursued relentlessly through boyhood and until, by marriage or the demands of business, he seeks a new path for himself. The system of education is based primarily upon thoroughness, and as time is not regarded as possessing any value, it can be understood that each branch of study is carried to its ultimate. The study of the Chinese classics is of the first importance; music, natural philosophy, astronomy, geography, botany, and engineering, all in turn receive careful attention, and because the end proposed to their minds is different from the western code, it does not follow that the range of study or the intricacies of the subjects are in any degree less than with our students. In fact, I am sure that in subtlety of analysis, in the pursuit of the formulated idea to the ultimate and logical conclusion, the Chinese student is far superior to his brother of any nation.

Add to all this the gift by nature of a marvelous memory, accustomed from its first efforts to minute and accurate observation, and it can be understood that the knowledge of an educated Chinaman is of the most superior order *from his point of view*, and even from our point of view it calls for the highest mental efforts of which the human brain is capable; but as their plane of thought and code of ethics is so opposed to what is called "modern progress," their knowledge does not appeal to the western mind as being a real education. In mental capacity the educated Chinaman is undoubtedly equal to the highest efforts of the best races.

The business capacity of the race is recognized the world over. It is in this direction that the Chinaman's principal modern triumphs

A CEMETERY AT CHINKIANG

From Commander Harrie Webster's collection of Chinese pictures

A CHARACTERISTIC CHINESE BRIDGE

From Commander Harrie Webster's collection of Chinese pictures

have been achieved. Throughout the East he controls the business of whole communities, and in the banks and financial institutions throughout India, China, Japan, and the Malay Archipelago the Chinese "*Shroff*" is the business center around which flourishes the vast commerce of the richest portion of the civilized world. Testimony to the Chinaman's business integrity is unvarying, and while it is true that no one is keener in driving a bargain, as soon as the terms of that bargain are settled the Chinaman may be depended on to carry out his agreement without a murmur, even though circumstances may have so changed as to threaten financial ruin. All through the East one is always told that a "Chinaman's word is as good as a bond." Under all circumstances he is commercially honest.

In mechanical ability and skill the Chinaman stands exceptionally high. In the foreign shops and factories of the East the native artisan compares favorably with the workman of any other nation. I refer entirely to western tools, methods, and machinery. In a broader sense, in the erection of bridges, construction of temples, roads, canals, in the wide sense of the engineer, the Chinaman compares well with his fellows in more civilized lands. Many of his bridges are marvelous not only for their beauty and accuracy of construction, but in the difficulties overcome and in the solidity of their foundations. Here the Chinaman's characteristic of thoroughness expresses itself. "The Chinaman builds for all time; the rest of the world builds for today."

The position of woman in the Celestial Empire is difficult for the western inquirer to grasp, and as the legal and political status of the sex is very low, it is hard to understand the immense social and commercial influence possessed by the wives of the better class of Chinamen. I say "wives" designedly, because plurality is the rule rather than the exception. In general knowledge of affairs the women of China compare favorably with their husbands. Women are educated through a system of private instruction.

In these notes on China and her people it has been the intention of the writer to touch on points of personal or individual interest. The genius of the native Chinaman cannot be grasped in a day, nor is it easy to acquire a knowledge of the family life of these people. Distrust of the "western barbarian" has become a part of the Chinaman's nature, and not until long acquaintance ripens into friendship does the real man appear. My opportunities for observation and comment extended over a period of nearly forty months, and I count the friendship of several Chinamen of the upper class among the pleasantest memories of a cruise on the China station.

THE NATIONAL GEOGRAPHIC SOCIETY'S ECLIPSE EXPEDITION TO NORFOLK, VA.

By Marcus Baker,

U. S. Geological Survey

Among the most interesting periodic occurrences in the proceedings of the National Geographic Society must be counted the annual excursion or field meeting, held in the early summer, when such members as are still in Washington are wont to visit, usually by special train or steamer, one or another of the many places of geographic or historic interest within a few hours' ride of the National Capital. Harpers Ferry, W. Va., Frederick and Annapolis, Md., Fredericksburg, Charlottesville, Monticello, the Dismal Swamp, Manassas Gap, and the Shenandoah Valley, Va., have all been explored during recent years under the leadership of men whose training or experience specially fitted them for their delightful task.

When it became known that the path of totality of the eclipse of the sun that was to occur on May 28 of the present year would be within easy reach of Washington, and that Norfolk, Va., with all its surroundings of scenic beauty and historic interest, would be a place from which the eclipse could be well observed, it was decided by the Board of Managers to charter a steamer and afford the members of the Society an opportunity to take one of the most delightful of excursions, and at the same time witness that rare and interesting event, a total eclipse of the sun.

In accordance with these arrangements, some 250 persons embarked on the steamer *Newport News* on Sunday evening, May 27, to wake up next morning in Hampton Roads, after a smooth sail of some 195 miles down the Potomac River and Chesapeake Bay. The eclipse was witnessed from the Portsmouth Navy Yard, under conditions that left absolutely nothing to be desired.

From Portsmouth the steamer proceeded to the shipyards of Newport News, from Newport News to Yorktown, and from Yorktown to Old Point Comfort and Fort Monroe, leaving for Washington in the evening and arriving the next morning in time for breakfast.

The company included the veteran astronomer, Dr Simon Newcomb; the revered and beloved author and divine, Dr Edward Everett Hale, and a large representation of the various scientific departments of the Government service. The excursion was unmarred by the slightest untoward incident, and will long be remembered by those who had the good fortune to participate in it.

THE SCIENTIFIC WORK OF THE NATIONAL GEOGRAPHIC SOCIETY'S ECLIPSE EXPEDITION TO NORFOLK, VA.

By Simon Newcomb, LL. D.

The expeditions spread along the path of total eclipse in the accessible regions over which it swept were so numerous and so well equipped that it was quite unnecessary for the National Geographic Society to attempt their work, even had it possessed the means of doing so. Its plan was therefore restricted to a modest attempt to supplement the work of others by such observations as did not require elaborate instrumental means or long previous preparation. The operations finally undertaken were three in number:

1. Observations of the times of contact and their comparison with prediction.

2. Photographing the sky during totality, the corona and other surroundings of the sun included, with the view of finding any unknown object and of making photometric comparison of the light of the sky on the disk of the moon with that away from the sun.

3. Observations of the so-called shadow bands.

The following imperfect summary of results is all that it is possible to prepare at the present time.

TIMES OF CONTACTS

As the observer had no optical instrument but a good spyglass, the second and third contacts were the only ones seriously attempted. Such an instrument is as good as a larger one for these contacts. The time was determined by a pocket watch, which was compared with the standard clock at the Naval Observatory the day before and the day after the eclipse. The corrections of the watch to eastern standard time thus determined were:

May 27 ..... Corr. = — 28^s.2
May 29 ..... Corr. = — 28^s.5

The correction at the time of the eclipse would then be — 28^s.3. It may be remarked that by a long series of comparisons the accidental daily variation of the watch is about ± 0^s.2, and that the mean rate during the three weeks before the eclipse chanced to be about zero.

As the second contact or beginning of totality approached, the observer was struck by the clearness with which a long arc of the chromosphere came out on each side of the diminishing arc of the sun's limb some seconds before totality. The observation of the beginning of totality was very satisfactory, the distinct arc of the sun's limb contracting slowly at first, then more rapidly, until it at length vanished at the following moment:

	Hrs.	Min.	Sec.
Contact 2. Watch time	8	52	54.5
Corr. of watch			— 28.3
Standard time	8	52	26.2
Greenwich time	1	52	26.2

	Hrs.	Min.	Sec.
Contact 3. Watch time	8	54	22 ± 1
Corr. of watch			— 28.3
Standard time	8	53	53.7

Duration of totality, 1 min. 27.5 secs.

The observation of contact 3 was less certain than that of contact 2, the doubt being ± 1 second.

The tabular times of contact for Norfolk as given in the *American Ephemeris* for 1900, with the corrections thus derived from observation, are:

	Tabular time.	Corr.
Contact 2	8 hrs. 52 min. 32.6 sec.	— 6.4 sec.
Contact 3	53 59.1	— 5.4
Duration	1 26.5	+ 1.0

PHOTOGRAPHS

The photographs were taken by Messrs W J McGee and W. H. Holmes with a large camera of 6 centimeters aperture and about 50 centimeters focus. It was fixed upon an inclined table without clock or other motion to follow the sun. Three plates were successfully exposed. A fourth was spoiled by the end of totality coming on before it was cut off.

These plates were specially prepared for the use of the expedition by Professors E. C. and W. H. Pickering, of the Harvard Observatory, and were sent to that observatory for development, examination, and report. The report is not expected in time for this number.

SHADOW BANDS

Many unexplained optical phenomena have been described in connection with total eclipses. The irregular, sporadic, and inconsistent

character of most of these justify us in classifying them as optical illusions. To this class probably belongs the seeming coming on of the darkness by a series of waves. A class of phenomena seen so frequently as to show that, whether purely optical or not, they follow a law, and are due to some definable cause, are known as shadow bands. An attempt was made to observe these on the plan outlined by the Secretary of the Smithsonian Institution. While the observations, through an unfortunate neglect to make preparations in advance, were not carried out in all the detail recommended in the plan, results were obtained which may not be devoid of interest.

Two parties took part in the observation. One, a large one, observed on the upper deck of the steamer as she lay at the navy yard pier, the other on the pier itself. Both made their observations on several white sheets spread out on the deck or ground, the shades on which they carefully watched.

From the steamer Mr Elbert B. Hamlin reported: "Bands pointed northeast and southwest. They vibrated at right angles to the way they pointed; this before totality. They came on from the northeast. After totality they were less pronounced; came on from southwest and pointed northwest and southeast. They moved slowly and were about two inches wide." Some of the party laid down sticks to show the direction of the bands, and inquiry was made by other members as to the direction they noted. Although in most cases the direction assigned agreed with that of Mr Hamlin, one observer, at least, saw the bands as lying northwest and southeast, while the three sticks ranged over more than 45 degrees.

On the wharf observations were made by Mr Claude Bennett and several others. As Mr Bennett's observations were sent to the Smithsonian Institution for discussion and comparison, they need not be given in full here. They may be expected to appear, with a number of others, elsewhere. From verbal statements made on the spot by Mr Bennett and two other observers, it would seem that there was no agreement as to the nature of the phenomena. Two observers assigned a motion in opposite directions; the third saw no well-defined motion and no distinct bands, but only an irregular flickering.

Some general remarks on the nature and cause of these phenomena suggested by the preceding observations, may not be out of place.

Two possible hypotheses are to be tested: (*a*) That the variations of light and shade are physical realities, and (*b*) that they are purely optical. It is known that when an eye is suddenly removed from

bright sunshine into comparative darkness its power of estimating intensity of illumination is so disturbed as to give rise to great seeming fluctuations—that is, a constant illumination will for a time seem irregularly variable. It is possible, though not very probable, that the seeming bands may be due to this cause, and may therefore have no physical reality.

But a possible physical cause for light fluctuations on a sheet is not far to seek. The twinkling of a star shows that if a star shone brightly enough to illuminate a large white sheet we should see the illumination to be a constantly changing and flickering one, varying in a way too irregular to admit of exact description. Possibly the same may be true of the light cast by the very thin crescent of the sun just before and after the total phase of an eclipse.

If this be the true explanation the appearance of well-defined bands of definite breadth will still remain unexplained. But this discordance already mentioned seems to show that this assignment of precise forms is of the nature of an optical illusion. Illusions of this sort are so common and so easy to fall into, we might almost say unavoidable, that no improbability attaches to them. The more careful and exact an observer is, the more likely he is to detect them in his own case and the less confidence he will have in his own observations of such phenomena as those in question.

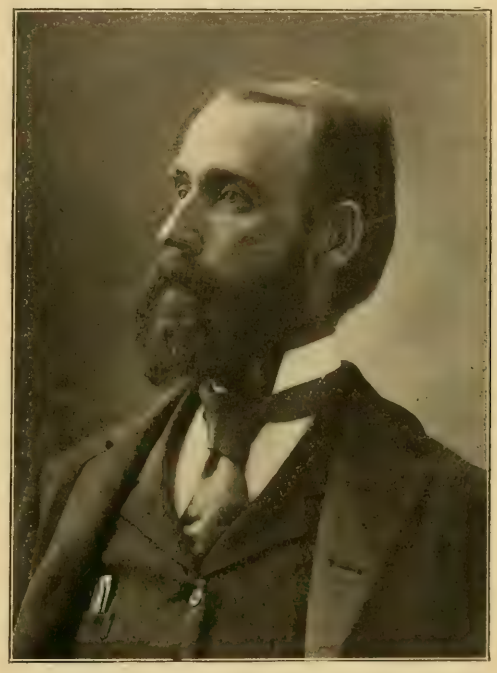
HYDROGRAPHIC WORK OF THE U. S. GEOLOGICAL SURVEY

In the state of New York much interest has been aroused in the question of the water supply of the state, both because of its importance for supplying power to manufactories and because of the proposed deep waterway from the Great Lakes to the ocean. Owing to the scarcity of water, some of the higher levels of the Erie Canal are operated with difficulty in the dry seasons. For a larger canal much more water must be had. How this extra supply may be obtained requires careful examination conducted through several years. On this problem the Hydrographic Division of the U. S. Geological Survey is now at work, coöperating with state officials of New York. The greater part of the water comes from the Adirondack Mountain area, where the forests are being preserved largely for their beneficial influence in water conservation. The extent of this influence is also being investigated, in order to determine, if possible, the value of the forest in regulating the stream flow.

The long-continued drought in California has forced public attention to the imperative necessity of providing water storage for the irrigation of farms and

orchards and for regulating the streams used for water-power and for industrial purposes. The State Legislature at its last session made an appropriation for investigating this subject, but the act failed to become a law. By private subscription, however, considerable sums have been raised for coöperation with the U. S. Geological Survey in carrying forward the examinations of reservoir sites and measurements of streams, notably on the headwaters of King River and in adjacent portions of the high Sierras.

In Montana the necessity for water storage for the further development of irrigation and power has been appreciated, and requests have been made for the examination of various natural basins suitable for holding floods. In particular the headwaters of Milk River have attracted attention, because these streams flow northerly into Canada, where, uniting, their waters return to the United States. It has long been the desire of the people of Montana to save the flood waters and carry them by suitable canals out upon the arid lands east of the mountains, instead of allowing them to flow northerly across the international boundary.



F. H. Newell,

Chief of Division of Hydrography, U. S. Geological Survey.

In the Southern Appalachian area, especially in Georgia and Alabama, many cotton mills are being constructed which derive their power from the rapid streams. This presents another task for the Hydrographic Division. Systematic measurements of the streams are needed to determine the low-water flow and the possible minimum power from each important river. Throughout the entire mountain area typical streams are being measured. Also in the arid west, from Central Kansas to the Pacific Ocean, the measurements of scores of streams are being continued in order to complete the plans for the vast system of water storage that will ultimately increase by one-third the fertile area of the United States. The artesian conditions in the arid west, in the Black Hills in Wyoming and South Dakota, are another subject of study. The sum of $100,000 was voted by Congress for the hydrographic work of the U. S. Geological Survey during the current fiscal year. This is double the amount appropriated for the purpose last year.

RAILWAYS, RIVERS, AND STRATEGIC TOWNS IN MANCHURIA

With the exception of some small gaps in Manchuria, only a few hundred miles in all, the Trans-Siberian Railway from St Petersburg to Port Arthur and Vladivostok is completed (see map opposite page 297). Trains from St Petersburg proceed direct to Irkutsk, on Lake Baikal. Heavy ice-breaking boats ferry the cars across the lake to Missoyaga, whence they are hauled to Onon and Stryetensk. Onon is the northern terminus of the branch to Port Arthur. Stryetensk is the head of the water-route down the Shilka and Amur Rivers to Khabarosvk, from which a railroad runs to Vladivostok, a distance of 475 miles. The branch from Onon to Port Arthur is being built in sections, most of them already constructed. Trains are now running northward from Port Arthur for 650 miles to Harbin, and probably before the end of summer they will reach Onon. The chain from St Petersburg to Port Arthur will then be complete. Serious trouble with the Chinese in Manchuria may, however, not only interrupt construction for months, but may endanger hundreds of miles of track already laid.

A branch line from Harbin is being pushed southeastward 500 miles to Vladivostok. This will probably before many months connect Vladivostok both with the main Siberian line and also with Port Arthur. Port Arthur has at present a combined railway and water-route to Vladivostok, which in turn has a combined railway and water-route to Stryetensk, the terminus of the Siberian Railway. The present means of transportation from Port Arthur to Vladivostok is by rail to Harbin, thence nearly 1,200 miles by river down the Sungari till it joins the Amur, then down the Amur to Khabarosvk, and from there by rail to Vladivostok. The trip takes eight to fifteen days. The rivers are open from May to October.

Thus Russia can easily throw thousands of soldiers into nearly every section of Manchuria. Sections to which her railways do not yet penetrate she can reach by the Shilka, Sungari, and Amur Rivers. She has on these rivers numerous flotillas of steamers and large barges. In the last few months alone 15 large steamers and 40 barges have been added to her river fleet. Troops coming from Europe and western Asia would be brought by rail to Stryetensk; thence they would be carried down the Shilka and Amur Rivers in flotillas to the junction of the latter with the Sungari. From here they could either be forwarded up the Sungari to Harbin, and thence by rail distributed among the cities of Kirin, Mukden, and Port Arthur, or they might continue on to Khabarosvk, and thence proceed by rail to Vladivostok. In case the former route to Port Arthur was interrupted by the Chinese troops, a fleet of transports could meet the Russian soldiers at Vladivostok and carry them the 1,250 miles around Korea to Port Arthur in five to eight days. When the Onon-Harbin and the Harbin-Vladivostok branches are completed an invasion of Manchuria will be a very simple matter.

Most of the towns of strategic importance to the safety of the railway lines through Manchuria are held by Russian troops. Harbin, the central meeting-point of the railway coming north from Port Arthur, of that going east to Vladivostok, and of that coming south from Onon, and also the head of nav-

igation on the Sungari River, will soon be the largest and most thriving inland city of Manchuria. It is a good example of Russian enterprise and push in the Far East. In February, 1898, not even a hut marked the spot. On the opening of navigation in the Sungari River that year the Russian engineers found that their larger steamers could not ascend the river to the point first chosen as the junction of the three railway branches, Khulanchen; so they decided on the site of the present Harbin, which is 30 miles lower down the river. In the few months since there has risen a splendid city of substantial houses and office buildings, with broad, well-paved streets, all lit by electricity.

Blagovestchensk, the capture of which was attempted by the Chinese recently, is on the Amur River, somewhat more than half-way between Stryetensk and Khabarosvk. It is important strategically, as its possession by Chinese troops would interrupt all communication between these towns, which, until the railroad from Onon to Harbin is finished, is the only route by which Russia can send to Vladivostok and Port Arthur the supplies and soldiers coming over the Siberian Railway. The town has 38,000 inhabitants, some of whom possess much wealth and handsome residences. At Aigun, a town of 15,000, and also the scene of some fighting, was signed in 1858 the treaty which opened the Sungari to Russian steamers. Along the northern bank of the Amur at intervals of 20 to 30 miles are numerous thriving villages, which were planted as Cossack posts by Mouravieff previous to 1858. Kirin, ten days by steamer from the mouth of the Amur, is the center of the most fertile country of Manchuria. It has a population of about 200,000. A small Russian garrison is located here. Tsitsikar has about 30,000 inhabitants and Petuna nearly 60,000

G. H. G.

Culebra, lying 20 miles east of Porto Rico, is about five miles long and two and a half miles wide. Viegas, or Crab Island, is half as far away, and is four or five times the size of Culebra. Dr Ullrich, the medical officer attached to the U. S. Coast and Geodetic Survey party that has been surveying the eastern shore of Porto Rico and connecting it with Viegas, Culebra, and St Thomas, gives some interesting information about Culebra. The climate is somewhat cooler and less rainy than that of Porto Rico. The general health of the people is good, but, strange as it may seem, the most prevalent diseases are consumption and rheumatism. Malaria also exists to a considerable extent where the soil favors its development. There is no good drinking water on the island except what the natives catch during the rainy season in two large cisterns. This water is dealt out daily to the people at the rate of one gallon per head for adults and one-half gallon for children. There are only two streams on the island that flow during the entire year. Water can be found by digging wells, but it always develops a peculiar odor after standing, and has a cloudy appearance and brackish taste. The island has excellent grazing facilities, and at least 2,000 head of fine cattle were seen. The most urgent recommendation of Dr Ullrich is that all drinking water should be either distilled or boiled. If this precaution is taken, he believes the climate of Culebra will prove as healthy as that of many favored places in the United States.

THE FIRST AMERICAN CENSUS OF PORTO RICO

The surprising preponderance of the white race, the density of the population and the evenness of its distribution throughout the island, the small number living in cities, the insignificant percentage of the foreign-born, the unusually large proportion of children, the small number of persons over 45 years of age, and the very high percentage of single persons (not including those living together as married), are the main facts revealed by the census of Porto Rico, taken October 16, 1899, under the supervision of the War Department. The total population is 953,243. The average number of persons to the square mile, 264, is about the same as that of Massachusetts, twice that of New York, and seven times that of Cuba. The evenness of settlement is especially remarkable, the least settled district having 58 persons to the square mile, about the same as the density of Indiana. Only two cities have a population exceeding 25,000—San Juan with 32,048 and Ponce with 27,952. While in Cuba 32.3 per cent and in the United States 29.2 per cent live in cities above 8,000, in Porto Rico only 8.7 per cent live in cities of this size. Again, while in Cuba 47.1 per cent, or nearly half the population, live in cities above 1,000, in Porto Rico only 21.4 per cent live in towns above 1,000.

The population would seem to be growing more rapidly than prior to 1860, the decennial rate of increase between 1887 and 1899 being 16.2 per cent, about the same as that of Ohio and Tennessee. The average increase of population in the interior has been more rapid than that on the seacoast—explained by the census experts as being probably due to the depressed condition of the sugar cane growing in the coast plains.

Contrary to general expectation, Porto Rico contains a large preponderance of native whites, 61.8 per cent of the total population. As this same revelation occurred in the case of Cuba, it is a question whether a like careful enumeration of the Central American Republics, of Brazil, and Mexico, might not show a larger number of white persons in each of these countries than is usually credited to them. Children under ten years of age form 31 per cent of the total population. Corresponding figures for the United States are 24 per cent and for Cuba 22.7 per cent. Persons over 45 years of age in Porto Rico form only 11.8 per cent, while in the United States they form 17.2 per cent and in Cuba 14.2 per cent, of the total population. Only three persons in every two hundred are foreign born.

Another interesting condition brought to light by the census is that the total number of persons married and living together as married amounts to only one-fourth of the population, whereas in the United States two-fifths of the population are married. This may be partially explained by the large number of children, for 49.6 of the population are under eighteen years of age. As in Cuba, the proportion of those living together as husband and wife by mutual consent is very large, 8.9 per cent, while 16.6 per cent are married, and, as in Cuba, the excessive expense of the marriage ceremony is the explanation. Education is in a very backward condition, 77.4 of those of ten years and over not being able to read or write and only seven attending school out of every 200 children under ten years of age.

U. S. BOARD ON GEOGRAPHIC NAMES

The decisions of the U. S. Board on Geographic Names will hereafter be published in the NATIONAL GEOGRAPHIC MAGAZINE. All the decisions of the Board up to June 1, 1900, are included in a report recently submitted to President McKinley and now in press. The Board recommended that, in addition to the usual number, some 1,800 or 1,900, 8,000 extra copies be printed for general and departmental use. On this recommendation the Senate acted favorably, but the House of Representatives took no action. The Board therefore has no copies of this report for distribution, and persons desiring copies should apply to their Representatives in Congress. The following are the decisions rendered since the report went to press:

Alamoosook; lake in town of Orland, Hancock County, Maine. (Not Great [pond].)

Bolden; run, Franklin township, Fayette County, Penna. (Not Boland.)

Brewer; pond, Penobscot County, Maine. (Not Orrington Great.)

Carasaljo; lake, Ocean County, N. J. (Not Caracaljo.)

Cotteral; brook, Ocean County, N. J. (Not Cotterall's.)

Douglas; post village and town, Worcester County, Mass. (Not Douglass.)

East Douglas; post-office and railroad station, Worcester County, Mass. (Not East Douglass.)

Garrett; island at mouth of the Susquehanna River, Cecil County, Md. (Not Watson.)

Green; lake, Hancock County, Maine. (Not Reed's [pond].)

Greenlake; post-office and railroad station, Hancock County, Maine. (Not Green Lake.)

Grove City; post-office and railroad station, Franklin County, Ohio. (Not Grove.)

Heagan; mountain, Waldo County, Maine. (Not Heagen.)

Lacarpe; creek, Ottawa County, Ohio. (Not Lacarne.)

Leonia; post-office and railroad station, Kootenai County, Idaho. (Not Leonai.)

Little Sandy; creek, Fayette County, Penna., and Preston County, W. Va. (Not Gibbons nor Gibbons Glade.)

Nikolaiefsk; town on the Amur River, 25 miles from its mouth, eastern Siberia. (Not Nicolaieffsk, etc.)

Osborn; island in Manasquan River, Monmouth County, N. J. (Not Osborne.)

Phillips; lake in Dedham, Hancock County, Maine. (Not Filtz, Fitts, nor Fitz [pond].)

Pine; knob in South Union, Fayette County, Penna. (Not Piney.)

Prestonsburg; magisterial district and post-office, Floyd County, Ky. (Not Prestonburgh.)

Sedgeunkedunk; stream, tributary of Penobscot River, Penobscot County, Maine. (Not Segeunkedunk.)

Soudabscook; river, Penobscot County, Maine. (Not Soadabscook nor Sowadabscook.)

Swan; lake in Swanville, Waldo County, Maine. (Not Goose [pond].)

Toluca; post-office and railroad station, Los Angeles County, Cal. (Not Lankershim.)

Whiting; post-office and railroad station, Ocean County, N. J. (Not Whiting's.)

FOREIGNERS AND FOREIGN FIRMS IN CHINA

There were more Americans resident in the Chinese treaty ports in 1899 than there were persons of any other nationality except English and Japanese. Of the 17,193 foreigners of all nations living last year in the Chinese treaty ports 2,335 were Americans and 5,562 English. The Japanese numbered 2,440, the Russians 1,621, the Portuguese 1,423, the French 1,183, the Germans 1,134, the Spanish 448, the Scandinavians 422, the Belgians 234, the Italians 124, the Dutch 106, and all others 161. Foreigners living in Port Arthur, Hongkong, and other ports ceded to European powers are not included in this category.

The Russians have recently been entering China in greater numbers than any other nationality. In 1898 there were only 165 Russians in the treaty ports, while one year later there were as many as 1,621, an increase of 882 per cent during twelve months. The number of English rose 414, of Americans 279, of Japanese 742, of French 263, and of Germans 91. In 1899 there were 70 American firms doing business in these ports, an increase of 27 over the preceding year. Of French firms there were 76, an increase of 39 in one year, and of Japanese 195, an increase of 81. The English were about stationary, having 398 firms in 1898 and 401 in 1899. The Germans had 115 firms, the Portuguese 10, the Belgians 9, the Italians 9, and other nationalities 29. It is a curious fact that there were only 19 Russian firms in all these ports. In 1898 there were 165 Russians and 16 business houses. One year later the number of Russians had risen to 1,621, but of Russian business houses there were only 19.

The principal treaty ports, of which there are about 30, are Canton, with a population of probably two millions; Tientsin, with about one million; Hankau, with 800,000; Shanghai, with over 400,000; Chifu, with 35,000; Amoy, with 100,000; Niuchwang, with 60,000; Fuchau, with 650,000, and Swatow, with 35,000.

THE Chinese farmer is the most economical of all tillers of the soil. In South China he reaps at least two and usually three or four harvests every year, but in spite of such constant draining the soil is as fertile as it was thousands of years ago. He saves everything for fertilizer. Everywhere are open, odorous vats, steaming with the soaked refuse of straw, vegetable ends, leaves, and bits that can serve for nothing else. When the mass is thoroughly decayed the water is drained off in buckets and poured over the growing rice. The sediment that settles in canals is minutely scraped up, dried, and scattered over the fields. The pigsty is cleaned only once in so often, because a too frequent cleaning would impair the quality of the filth. Even the dust and sweepings of the house are hoarded by the wife, who expects to get enough from their sale to keep herself supplied with brooms.

A GROUP OF CHINESE FARMERS

From Commander Harris Webster's collection of Chinese pictures

FROM THE LATEST PHOTOGRAPH OF MINISTER CONGER, TAKEN IN MAY, 1900

1. Minister Conger 2. Viceroy Foo Chow 3. U. S. Consul 4. Commander Knox, U. S. Navy U. S. Naval officers and Chinese officials

By courtesy of The Evening Star, Washington, D. C.

THREE BOOKS ON CHINA

China: The Long-lived Empire. By Eliza Ruhamah Scidmore, Foreign Secretary of the National Geographic Society, Author of "*Jinrikisha Days in Japan*," "*Java: The Garden of the East*," etc. With many illustrations. 8vo, pp. xv + 466. $2.50. New York: The Century Co. 1900.

Made timely by the chance of national events, Miss Scidmore's latest book is a milestone marking the progress of Occidental knowledge concerning the Far East. Writing in narrative style, touching lightly on the greater episodes and characters in the history of The Long-lived Empire—and this chiefly in connection with their monuments and relics—ostensibly recording her own observations and experiences, and referring in incidental fashion only to previous travelers from Marco Polo and Abbé Huc to Rockhill and Sven Hedin, and to the standard book-makers from Yule and Wade to our own Wells Williams, Heber Bishop, and General Wilson, the author skims the cream of a rich literature, condenses much knowledge into small space, and imparts a pleasing personal flavor to the lump. The permanent value of the work is enhanced by the fact that the chapters were written before the recent Boxer outbreak, with its world-shocking consequences, so that the treatment is temperate and judicial. Viewed in the light of recent events, portions of the book—especially the opening chapter on "The Degenerate Empire"—seem curiously prophetic. There is an ethnologic aroma to this initial chapter: "No Occidental ever saw within or understood the working of the yellow brain, which starts from and arrives at a different point by reverse and inverse processes we can neither follow nor comprehend. There is little sympathy, no kinship nor common feeling, and never affection possible between the Anglo-Saxon and the Chinese. Nothing in Chinese character or traits appeals warmly to our hearts or imagination, nothing touches; and of all the people of earth they most entirely lack 'soul,' charm, magnetism, attractiveness. We may yield them an intellectual admiration on some grounds, but no warmer pulse beats for them" (pp. 4, 5). These expressions touch on the fundamental fact of ethnology that, while all minds of given culture-grade respond alike to like stimuli, minds of different degrees of culture, different races, do not work alike; the utterances imply realization of the fact (whatsoever the view of the theory) that the users of the highly associative Chinese language can never harmonize with the users of concrete Anglo-Saxon speech—at least until the higher vehicle of thought replaces the lower, as in certain brilliant examples of recent history; and these, like other passages leavening the book, explain the charm of China to the Occidental traveler and reader. "It is a land of contradictions, puzzles, mysteries, enigmas" (p. 6). The second chapter, "The Edge of Chihli," describes the way now trod by foreign feet and held by foreign arms, and the third, "Tientsin," portrays the ancient city of over a million people now showing large in the eyes of the world; the seventh chapter, "The Tartar City of Kublai Khan," and the eighth, "Imperial, Purple Peking," are of no less living interest today, while the

ninth chapter, "The Decadence of the Manchus," depicts the present governmental structure, gives some account of the governmental personnel, and reveals the weaknesses in the armor of the dynasty today—its presentation being especially illumined by the frontispiece to the book, a curious half-portrait, half-hashish-vision, of the Empress Dowager, Tsi An. Half a dozen chapters follow on Pekin and its environs, and another brings out new views of "The Great Wall of China;" while the chapter on "The Valley of the Ming Tombs" is of both historical and archæologic interest, as is that on "Suburban Temples." The descriptions of Shanghai and Canton are vivid; the sketch entitled "In a Provincial Yamun" gives suggestive insight into diplomatic and social China; "The River of Fragrant Tea-fields" outlines that industry which forms China's strongest bond with the moving world; while the twenty-eighth and final chapter, "The Chinese New Year," touches a subject attractive not only to the tourist, but to all citizens and subjects reached by wandering celestials—for wherever he goes the almond-eyed devotee carries a time-cult curiously suggestive of the time-factor formed by his ancient empire in the history of the world. The author concludes: "China is very old, very tired, sick. It craves rest and peace—anything for peace; peace at any price. It does not want to be dragged out into the fierce white light and the contests of the new century" (p. 459). Yet she qualifies the diagnosis: "The Occident is fortunate in assisting at one of the many great downfalls, but it need not assume that this is at all the end, the absolute and final ruin, the last wreck and crash of the old empire, of its curious, four-thousand-year-old civilization, all because the present *parvenu* Manchu dynasty happens to fall. It has broken up before!" (p. 3). On the whole, the work is thoughtful, clear, scholarly, scintillating where not steadily brilliant, as is to be expected of the author; it is Miss Scidmore's best book. The publishers have done well: the printing is admirable on excellent paper, the numerous illustrations are beautifully executed, the index is clear and half full enough, while the cover is an appropriate symphony in yellow and red and dragon-eyed ideographs.

W J M.

China in Transformation. With 16 maps and one cut. 8vo, pp. x + 397. $3.00. 1899.

Overland to China. With 36 illustrations and four maps. 8vo, pp. xii + 465. $3.00. By Archibald R. Colquhoun. New York and London: Harper & Brothers. 1900.

The author of these works, by profession a civil engineer, is a geographer of world-wide reputation. He has traveled widely, especially in the Far East, and with rare powers of observation and ripened judgment. He has held several posts of responsibility in India and Burma, and has spent many years in sojourn and travel in China and its neighboring lands.

The first of these volumes is especially devoted to China, and within its pages is condensed an extremely full and interesting account of the Flowery Kingdom. The book opens with a geographic description of the country, a brief but clear presentation of its topography, especially in its relation to the people and their industries. Estimates are given of the population, and the author is

disposed to accept the minimum rather than the maximum estimate of its number, placing it considerably under 400,000,000. A curious fact is that their geographic names are not names, but descriptive appellations. It is as if we should say, not "Long Island," but "the long island."

China, although inhabited by civilized man for thousands of years, has scarcely commenced the development of her natural resources. Although abounding in coal and ores of iron, copper, lead, gold, and other metals, the development of these deposits has barely begun. Although producing in the aggregate vast quantities of certain crops, tea, tobacco, opium, silk, and cotton, the country has astonishingly little trade, even internal trade. This is owing to the fact that there are very few railroads and that the wagon roads are everywhere almost impassable. Coal, which at the pit's mouth is sold for fifteen cents per ton, brings as many dollars per ton ten miles away. One part of the empire may be suffering from famine while one hundred miles away the people may be rolling in abundance.

Two-thirds of the foreign trade of China is in the hands of Great Britain, the remainder being mainly with Japan, the United States, Germany, and Russia. The foreign trade is carried on almost entirely through the treaty ports, and foreign goods penetrate the interior of China only through Chinese merchants. Lacking push and initiative, as they do, the introduction of foreign goods into the interior is making very slow headway. Russia and Germany are doing somewhat better than other nations, inasmuch as they have agents scattered over the interior for the purpose of introducing their goods, and in recent years more progress in the extension of commerce has been made by them than by their rivals.

The government of China rests upon the family as a unit and is built upward and outward therefrom. It is a development of the principle of local self-government and is highly organized, especially in its smaller units. Herein lies the secret of the strength of the Chinese people. Dynasties may come and go (although in no other country on earth have single dynasties held their places so long), but the Chinese are still Chinese. They were conquered centuries ago by the Manchus and have been ruled by them since, but they have conquered their conquerors and amalgamated them with themselves. China is divided into eighteen provinces, each with a governor or viceroy, who is in most matters independent of the central authority at Pekin, being accountable to him for but little more than the payment of taxes. The Emperor is the father of the people, standing between them and the Supreme Ruler, and is accountable to him alone.

The second book is, in the main, devoted to countries other than China. In 1898–'99 the author journeyed *via* the Trans-Siberian Railway to Lake Baikal; thence to the desert of Gobi, to Pekin, southward to the Yangtze, and up that river to the head of navigation; thence through the southwestern provinces of China to Haifong. Siberia, with its railway, and Manchuria are described. The author shares with most Europeans an exaggerated idea of the greatness of Russia's undertaking in the construction of the Siberian Railway, a matter of building some 4,000 miles, or about one-third as much as has been built in the United States in a single year, and that along a very favorable route. Of

the importance of this railway to Russia in a material and economic view there can be no doubt.

His picture of Pekin and of the life of the legations there in past and recent times is exceedingly graphic. The ancient walled city, swarming with human life, whose hostility to the handful of foreigners is held in check only by fear; the little settlement of foreigners near its center, without social intercourse or relations with any outside their own circle, are strikingly pictured. Until recent years this little colony of foreigners was by its isolation a unit in all matters political and social, but with the advance of Russia in the accession of China's territory and the success of Germany in matters of trade, dissensions sprang up, and in later years the little colony has failed to present a united front either in matters political or social.

China is disintegrating. Russia has made her preparations for the final catastrophe. Indeed, she has, in all probability, aided in bringing on the crisis, and is ready to lay hands upon all the territory which she can acquire. Germany, though late in entering the great game, is also prepared to seize whatever may help her trade. France, on the southern border, is aiding and abetting Russia with a view to receiving her share of the spoils. On the other hand, Great Britain, the United States, and Japan are agreed in supporting the tottering empire, in the opening of the country to trade, and in the maintenance of the open door. The next few months will probably show whether the Anglo-Saxon, the German, or the Slav will control the situation. It is America's opportunity.

H. G.

A GENERAL continuous map of the region from St Michael to Port Clarence the U. S. Coast and Geodetic Survey hopes to present by the end of the season. The position of Sledge Island, lying to the westward of Cape Nome; the shoreline on the northern part of Norton Sound and in Golofnin Bay, and the approaches to and harbor of Port Clarence will be determined in great detail.

TELEGRAPH lines connect Pekin with the principal towns of China and by the Trans-Siberian telegraph line with Europe. From the towns on the border of Manchuria wires run to Pekin; also from Port Arthur, Seoul, and Chemulpo. Canton and the principal cities on the seaboard connect with the capital *via* Shanghai and Chifu. From the coast one line penetrates from Canton to Yunnanfu, the capital of the province of Yunnan, and another extends up the Yangtze Valley to the border of Tibet.

MISSIONARIES have penetrated to nearly every province in China. Pekin may perhaps be called the center of the Catholic missions and Shanghai the Protestant center. The field of the American Presbyterians, who have more workers in China than any other single denomination except the China Inland Mission, has been Shantung. The Baptists and others have pushed on to the more western provinces. The Catholics divided the country into five sections, one being allotted to each of the five orders—the Franciscans, the Jesuits, the Dominicans, the Augustinians, and the Lazarists. Probably 1,425 is a fair estimate of the number of American and European missionaries in the empire. The Catholics claim 1,000,000 native converts and the Protestants about 100,000.

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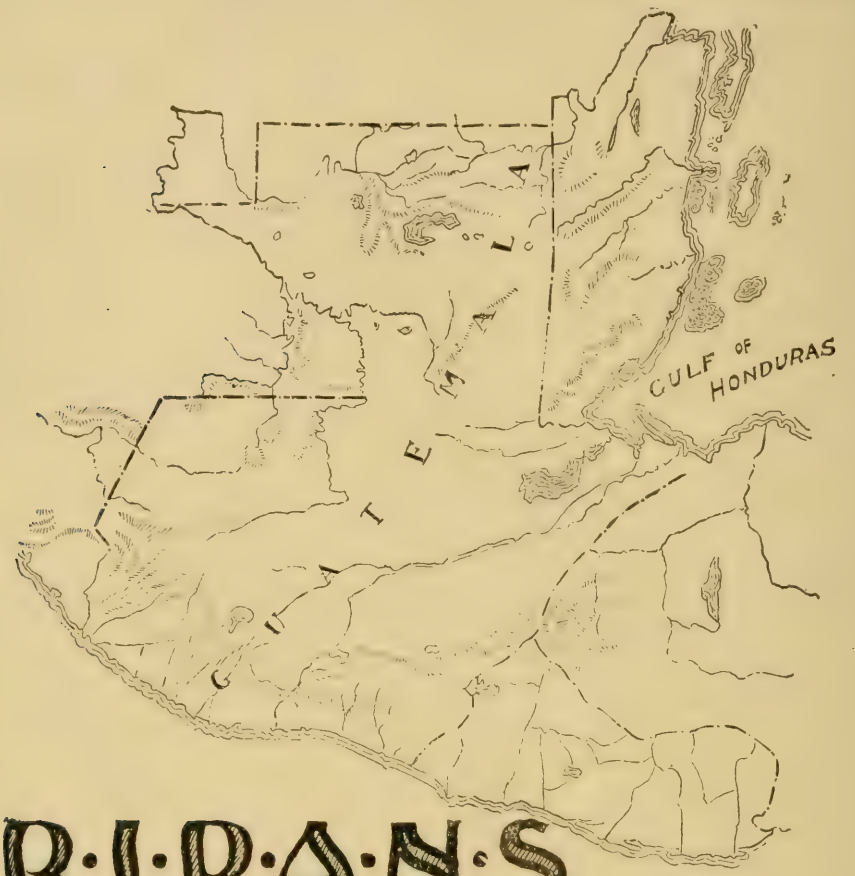

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THE

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VOL. XI SEPTEMBER, 1900 No. 9

THE COLORADO DESERT

By DAVID P. BARROWS

The Colorado River, its cañon valley, and flood-plain constitute a series of physiographic conformations of impressive variety. The upper part of its course has been eroded across the great elevated plain of western America, through which it has cut its channel downward with so great rapidity that its valley walls, almost unaffected in comparison by weathering, rise sheer upward in the gigantic system of gorges known as the Grand Cañon of the Colorado. From the point where it enters California it is no longer a downward eroding stream, but sweeps grandly across the sterile plain of the desert, a dark, sediment-laden current, swinging back and forth across its widening valley. As it nears the Gulf of California and the rapidity of its stream lessens, the enormous loads of fine rock material, cut from the valleys through which it has torn its way, are deposited in a great flood-plain or delta, across which the stream pours south into the gulf.

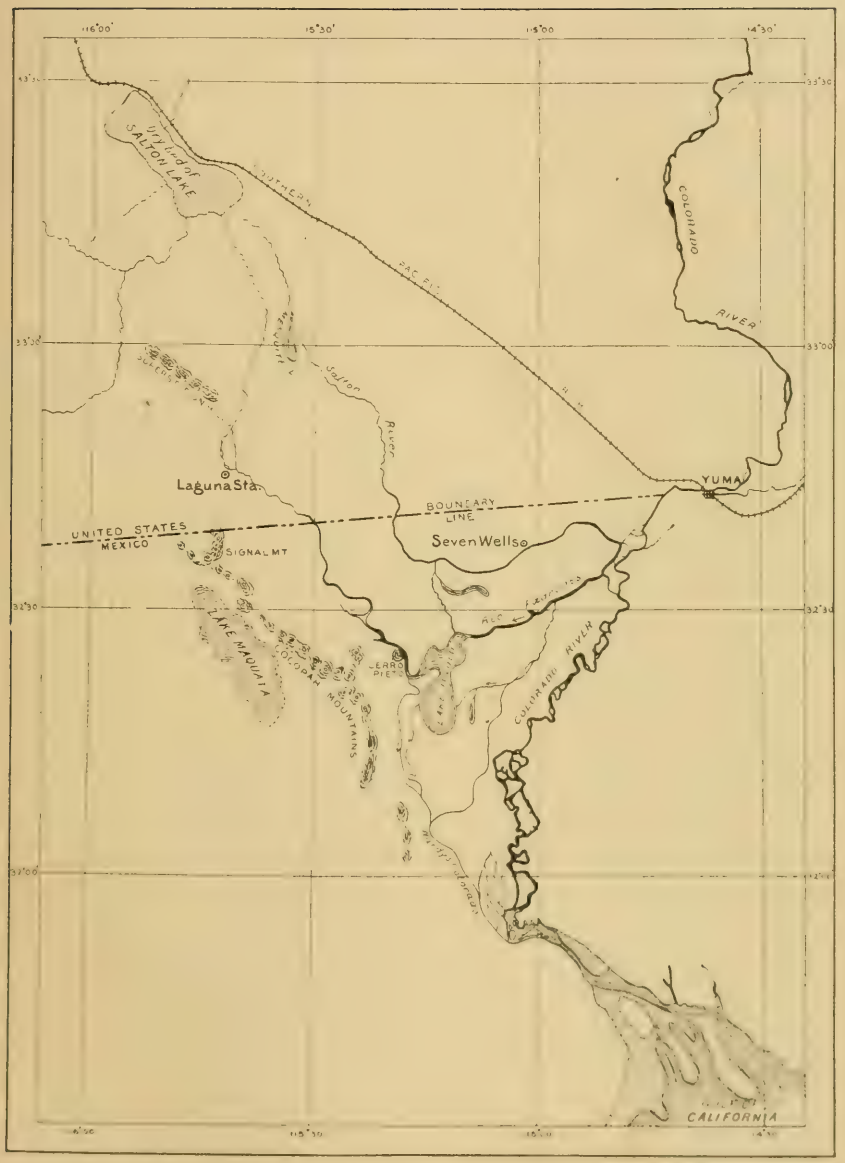
As above this delta the low banks are unwatered, except at the very margins of the river, the sterility of the surrounding country is unaffected by its immense volume of water.

From whatever direction you approach the river within California or Arizona, the trail lies across sandy hill and thirsty plain, where are the dark marks of old volcanic activity, grotesque rock forms, shaped by wind erosion, and occasional stunted clumps of desert plants, with extremely modified foliage; but nowhere is there suggestion that you are upon the banks of the mightiest river of western America, until suddenly the ground drops slightly, and in an instant there come the dark green coloring of mesquite growth, the bright foliage of cottonwood and willow, the dazzling gleam of wide waters, flowing swiftly, and you are beside the long, shining river of Lopez de Cardenas and Alarcon.

The discovery of the Colorado is one of the romances in the history of the discovery of this continent. In August, 1540, only 48 years after the first voyage of Columbus, the three small ships of Captain Hernando de Alarcon, sent up the Gulf of California to coöperate with the land expedition of Coronado, arrived at the shallow, treacherous head of the great estuary, and, in the language of the chronicle, "it pleased God that after this sort they should come to the very bottom of the bay, where they found a mighty river, which ran with so great a fury of a stream that they could hardly sail against it. So they entered into two boats, which men towed along with ropes from the shore." Up this river, which he named the "Buena Guia," cultivating friendly relations with its numerous Indian peoples, Alarcon went as far, it is believed, as the junction of Williams Fork, 85 leagues, according to the Relacion, "to where the river forms a straight channel between high mountains."

In the same months that Alarcon was dragging his boats up the turgid current, Coronado, now at the Pueblo of Zuñi, heard of the Moki Pueblos of Tusayan. Pedro de Tobar, with 20 men and a priest, made the expedition from Zuñi into that desolate corner of Arizona, where high on their mesas are still standing, as they stood then, the cliff villages of Hualpai and its companions. From these Indians Tobar heard of a great river flowing across the western desert, and returning with this information to Coronado, the chief dispatched Garcia Lopez de Cardenas to search for it. His little band, returning to the Moki villages, struck boldly out across the desolate plain of the "Painted Desert," and after days of travel stood on the brink of that chasm of chasms, the Grand Cañon of the Colorado. They gazed northward across the apparently unending buttes and gorges of the wonderful system, but were unable to reach the great river that looked like a slender rivulet far beneath them. "Its banks were so high," says the Relacion, "that they seemed to be raised three or four leagues into the air. The country is covered with little, stunted fir-trees, is exposed to the north, and is so cold that, although it was summer, we could hardly bear it."

Thus from sea and by land in the same year did the men of Spain discover the noble river of the Colorado at its most stupendous approaches. Almost at the same time a third little band, under Melchor Diaz, starting from the settlement of San Hieronymo, on the Rio Sonora, traversed Arizona from east to west and reached the banks of the Colorado which Alarcon had recently trodden. "In the



MAP SHOWING THE COLORADO DESERT REGION

course of less than six months," says Bandelier, "the Spanish reconnoitering corps had thus three times touched the largest river of western America, had explored its shores with tolerable accuracy for a considerable length of its course, and had also traveled in two directions through parts of Arizona which have only in very recent time again attracted attention."

The arid region of North America covers a large area. Throughout there is presented that strange uniformity of physical features and life-forms that characterizes deserts the world over. The southern portion of the Colorado Desert possesses, however, *bizarre* and curious features of its own. Its area is commonly understood to comprise the great depressed valley lying half in southern California and half in Lower California, inclosed on the west by the southward extensions of the San Jacinto Mountains, on the north by the desert range of the San Bernardino and Chocolate Mountains in California, and on the south by the course of the Colorado River from Arizona to the gulf.

In very recent geological times this region was an arm of the sea and the Colorado River reached the Pacific Ocean at Yuma. The geological changes that won this valley from the gulf seem to have been two: the upbuilding of an enormous delta from the deposits of the Colorado, and the crustal elevation of the earth beneath the central region covered by this delta to a height sufficient to divide the depression and to retire the gulf to its present shores far south of the line, while it left the upper part still below the level of the sea.* These movements turned the Colorado River into the region still depressed and transformed it into a splendid fresh-water lake. The evidence of the extent of this body of fresh water is most interesting. Its old floor remains, a deep accumulation of fine, fluviatile soil, rich as the delta of Egypt, which in places is whitened by myriads of fresh-water shells, several small univalves, and a single bivalve, varieties of *amnicola* and *anadrom* still to be found alive in the Colorado itself. For miles along the mountain bases at the northern end, where the still waters of the lake once reached, there runs a broad, white band of calcareous deposit from the tiny mollusca that at one time inhabited its shores. Gradually, however, the river which fed this lake by its constant deposits built up an elevated flood-plain about its mouth that diverted its waters more and more away from the lake until the main channel, impounded in levees of its own making, carried the current

*Salton, the lowest point in the desert, is given at 263 feet below sea-level, while Yuma is 275 feet above.

southward once more to the sea. The lake, fed irregularly and poorly, gradually dwindled as the silted banks of the Colorado became more secure, until it is represented today only by the Salton morass and other lagoons and the summer overflow streams by which these are supplied.

All this took place in very recent time. The Coahuila Indians, who today inhabit the upper end of the valley, have a distinct and credible tradition of the drying-up of this lake and of the occasional sudden return of its waters; and the Diegueños, who lived at a time when the supply of water along the central portion of the valley was probably much greater than at present, raised on the naturally irrigated soil abundant crops of maize, melons, and beans. But slowly the valley was abandoned to aridity. Almost unvisited by rainfall except about the edge of the mountains, the loss of the river left it cruelly dry. Low and inclosed between heat-reflecting ranges that shut off the breezes of the ocean, it gained a temperature which is one of the highest on the globe. The wind storms that rage up the valley from the southeast have drifted great dunes of sand over certain portions, and much of the country never reached by the deposits of the lake is as black, stony, and repulsive as eruptive rock formations in the desert can be. Apparently about the middle of the first half of the century the overflow from the Colorado was largely checked and not resumed to any extent until the year 1849. The Indians, who had lived in plenty along the central valley, were driven by the drought forever from their homes.

In November, 1847, the advance column of American troops, under Kearny, moving across from Fort Leavenworth for the conquest of California, crossed the desert from Yuma to San Diego. The troops suffered severely from thirst, finding no water, except a scant supply at Alamo Mocho, the first station after leaving the Colorado. In the middle of the plain they found a salt pool, approached through a thick, soapy quagmire, but the water was unfit for man or beast. This lake indicates at least a slight overflow at that time, and Major Emory reported that captured Spaniards who guided them told of a stream of running water some miles south of Alamo. This stream the Americans were unable to find (no overflow taking place so late in the fall), and their experience led them to announce the desert as almost wholly without water supply.*

But in 1849 came the rush of emigrant parties from the southern

*See the report of Major Emory, "Notes of a Military Reconnoissance," etc., Washington, 1848, pp. 100–102.

states through Texas and New Mexico along the Gila River trail into southern California, and these parties, pushing from the Colorado across the awful desert that separated them from the fertile lands of the coast, when midway on their course unexpectedly found themselves on the banks of a strong, turgid stream, which was not flowing toward the sea, but sweeping strangely northward into the interior. It was the sudden and dramatic resumption of the old Colorado inundations. They called it the "New River." Lieutenant Wilkinson, writing soon afterward in the Pacific Railroad Reports, says of this phenomenon of 1849:

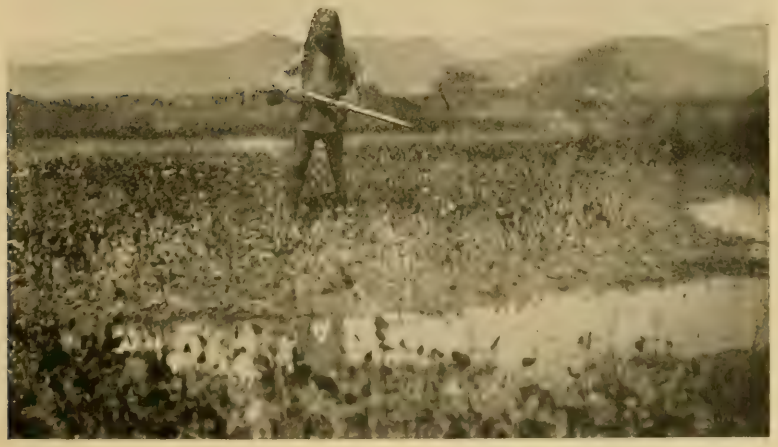
"In that year the Colorado River was very high, and broke over a part of its banks between the mouth of the Gila and the head of the gulf. The waters flowed inland, running backward through the desert toward the center of the ancient lake. . . . The appearance of the stream was a subject of general surprise and wonder, and was an unexpected relief to the many emigrant parties crossing the desert that year. It is the general belief that this overflow was the first recent instance of the kind, but it had evidently often taken place long before, and there are many reasons for believing that it once flowed in a larger and stronger stream than it has since its existence became known." *

Since 1849 the overflow of the Colorado River has been frequent, and since 1890 uninterrupted every summer. By most dwellers in southern California this overflow is well understood, but very few are aware of the circuitous and remarkable route by which the water of the Colorado, through New River, reaches Salton Sea. High water in the Colorado comes in the months of May and June, and the break in the upbuilt banks of the river occurs 10 or 12 miles below the Mexican boundary line, near Algodones, an old Yuma Indian village, where now is a Mexican hamlet and a station for several customs officers. From near the point where the break occurs a comparatively small current, the East or Alamo River, cuts its channel westward for about 30 miles, and then turns northwesterly into the United States, and on its way to the Salton Sea fills a large depression known as Mesquite Lake. The greater part of the overflow, however, takes another direction, and sweeps southwesterly almost entirely across the lower part of the desert until it meets the slope of the Cocopah Mountains. Here it creates a long, shallow body of water, called Volcano Lake.

This point is the divide, where the desert slopes northward into the United States and southward to the gulf, and from this lake the

* Pacific Railroad Reports, vol. v; "Geological Report," by Wm. P. Blake, Washington, 1857, 100.

waters break away in both directions. The main current flows southward, and is called Hardy's Colorado, or the Hardy River. But when the overflow is at its height and the region about the lake has become a vast area of inundation, a splendid stream bursts away down the northern slope backward into the interior. This is the New River. Its main channel is accompanied by many sloughs, and wide areas for miles on each side of the current are submerged. Shortly after crossing the boundary line, the New River flows through a de-



LAND RECENTLY INUNDATED ALONG BANKS OF THE HARDY — THE COCOPAH MOUNTAINS IN BACKGROUND

From a photograph by the author

pression about half a mile long and 20 feet deep, known as Cameron Lake, and from here along its winding course northward are many lagoons and water-holes, for the most part pools of a few acres of extent, lying off the main channel and connected with the New River by short sloughs. They are surrounded by a growth of mesquite, and water in all of them lasts for many months after the New River overflow has ceased. Cameron Lake is one of the largest and deepest, and its waters have usually "held over" from one overflow to the next, the small, dirty, and reeking pool into which it subsides late in

the spring being the main reliance of desert travelers. The river, however, passes directly through the lake, and the loads of sediment which it deposits at every checking of its course are gradually filling up Cameron Lake and making it less reliable.

But even after the great summer inundation of the desert has subsided and Volcano Lake has become exhausted, the Hardy continues to be fed from the break in the Colorado through the Rio Padrones, and throughout the year its channel contains water. In summer and until late in the fall its current is from 100 to 200 yards wide and 20 to 25 feet deep, with a flow of at least two miles an hour in the center of the stream. Below the Sierra Madre it turns eastward, and joins the main channel of the Colorado again just above the gulf. At times of very high water a curious result occurs. Westward of the Cocopah Mountains lies a great depressed plain, lower than the Cocopah Valley, lower than the sea, the desert of the Laguna Maquata or Salada. Like the Colorado, it was lately an arm of the ocean. At the southern end of the Cocopah Mountains the Hardy sometimes overflows and sends a current around the foot of the range and northward into this low region, creating the Laguna Maquata. This desert of the Laguna Maquata is a desperately arid and forsaken country, almost without water, except during these occasional backsets of the Hardy.

The main lines of travel—the old San Diego road through Jacumba Pass and the Warner's Ranch stage road by way of San Felipe and Carriso Creek—meet on their way to Yuma at Laguna Station, pass by Indian Wells and Cameron Lake, and a few miles further on turn southward into Mexico and follow the Alamo wash to the Colorado River and Yuma. Scores of traveling teams continue to cross the desert each year along these old emigrant and government roads. The lower portion of the Colorado Desert, however, which lies in the Mexican Territory of Lower California and which extends from the boundary line to the gulf, is far less known and is, in fact, visited by few Americans or Mexicans. It is known as the Hardy River country or the Cocopah country, from the Indians whose *rancherias* lie along the Hardy Valley and the Lower Colorado.

We visited this interesting country in August, 1899. The overflow had been of unusual amount and of more than ordinary duration. New River was still a swift, roily stream that defied crossing with wagons. All night, in order to avoid the heat of the day, we had been pushing our mule teams across the sandy plains and rough mesas that make up those portions of the desert between the Sierra and the rich, level, fluviatile deposits of the central depression.

THE CRATER OF THE SIERRA PRIETA

From a photograph by Mr Frank Stevens

THE MUD-VOLCANOES OF THE HARDY — COLORADO DESERT

From a photograph by Mr Frank Stevens

Coyote Wells, a historic water-hole, was passed at midnight. The ruins of an old *adobe* hut and a couple of hacked mesquite trees amid the rock and sand gave suggestion of its former importance as a stage and emigrant station. The long, ghostly sand piles of Superstitious Mountain gleamed faintly in the moonlight on the left, while on the right, clear and beautiful, though miles away and below the line, rose the black dome of Signal Mountain. Daylight only made more clear to the eye the sterile and unredeemable character of this part of the Colorado Desert. Too high for the irrigating waters of the river, rough and hard with broken lava, and desolate with wind-piled sand-dunes, it must always remain the abandoned area it is at present. By an imperceptible grade the way led down into soil that presented the firm, dry clay deposits of the ancient lake. The discovery of the overflow was unexpected and sudden. There was a wide glint of shallow waters that looked like mirage, then sheets of green things growing riotously in the warm air and wet soil, and a darker fringe of mesquite that bordered lagoons and river. There were in sight a thousand head of cattle recently driven in from the mountains, with heads deeply buried in the succulent herbage. Large flocks of waterfowl waded in the shaded margins of the lagoons and filled the air with their cries. The New River had overflowed its banks at this point, the cattlemen assisting the break by cutting in mesquite trees and damming the current, and swift sloughs, some 20 feet wide, were sweeping out over the plain and irrigating the region for miles. Cameron Lake and the lagoons were full to their brims and the country could be traversed only by making laborious circuits.

From Cameron Lake the trail turns southward, following in the main the channel of the New River. The Cocopah Mountains bound the valley for its whole length from the line to the sea on the west. The slopes and sides of the range appear to be utterly devoid of vegetation. Weathering and wind have broken its long mass into vast fragments of stone. Though occasionally exhibiting delicate tints of color, its general appearance is the sand gray and volcanic brown of desert formations. Groves of ironwood grow along its base amid the rough detritus that forms great alluvial fans. Elsewhere along the base of the range there is a vigorous growth of the "okatilla" (*Fouquiera spinosa*), curious clumps of long, whip-like stalks, devoid of foliage, but covered everywhere with thorns. The creosote-bush (*Covillea tridentata*) dots the sands. Far back in the cañons are groves of the tall and wonderful desert palms, indigenous to the Colorado Desert region, probably the *neowashingtonia filamentosa*.

As the way leads southward, Signal Mountain, the northern peak of the Cocopah range, disappears from view, but in front appears, rising from the plain, an isolated and striking landmark, the noble crater of the Sierra Prieta, called by Americans "Black Butte." Such active eruptions of lava as built up this perfect crater are indeed past, but secondary volcanic activity is still present in the hot mineral springs that surround the Colorado Desert and in the beautiful eruptive mud springs or *salses*, known as mud-volcanoes. These are found in two places on the Colorado Desert—in the Cocopah Valley a few miles from Sierra Prieta, and far north, just south of Salton Sea.*

The whole region of the Sierra Prieta is full of evidence of recent action. North of the mountain and half a mile from its base are three hillocks, the largest 100 yards long and 50 feet high, which were evidently formed by the eruption of soft mud accompanied by gas. The rock of these mounds is imperfectly hardened mud, full of vesicular cavities such as would be formed by the presence of gas in the mud eruption. The Sierra itself is several hundred feet high, and, with the deposits of broken lava that surround its base, has a circumference of seven or eight miles. The rock is scoriaceous lava, with occasional basaltic blocks that exhibit an imperfect columnar structure. The rock of the sides is much broken by weathering, but the edge of the crater is beautifully defined. The floor of the depression is smooth and level and covered with fine clay, evidently blown in by winds. Water at times has stood at considerable depths within the crater. It is 250 paces across the perfectly circular bottom. At the center of the floor a small basin has been scooped out by human hands to collect the last drops of rain water.

The mud-volcanoes lie on a flat, mud plain south of the Sierra Prieta, and during the overflow are surrounded by the waters of the New and Hardy Rivers and the "salt slough;" also a few of the springs are buried beneath the risen waters of Volcano Lake. At the time of my visit one of these springs was erupting beneath the water, throwing up mud several feet above the surface with a cannonading that could be heard at a distance of three or four miles. Along the shores

* For an interesting description of their discovery by Major Heintzelman, in 1852, see Pacific Railroad Reports, vol. v; "Geological Report," by Wm. P. Blake, p. 115. See also "An account of some volcanic springs in the Desert of the Colorado in Southern California," by Dr John L. Le Conte, American Journal of Science and Art, 2nd series, vol. xix, May, 1855, and "Notes of a visit to the mud-volcanoes in the Colorado Desert in the month of July, 1857," by Dr John Veatch, in the same journal, vol. xxvi, p. 286, 1858, and also published in the Proceedings of the California Academy of Science, 1857, p. 104.

of the lake spurted jets of hissing steam, and little streams of hot water escaped from the fissures. Tiny monticules of mud were everywhere. At the edge of the water were four or five mud craters, 8 to 12 feet in diameter, filled with hot water, in which was a constant ebullition and escaping of gas. The bank was covered with black earthy deposits, and a curious reed grass grew at the edge of the water. The moist ground was everywhere hot and the tiny rivulets scalding. The retiring of the shores of the lake after the overflow has ceased leaves most of this ground dry during the greater part of the year. A small pool is left, however, whose waters assume a deep wine color, due, I should suppose, to deposits of peat derived from old growths of the reed grass. It is called the Laguna Prieta, or Ink Lake. At this place I noted that the retiring waters, trickling through a small basin, twenty feet across, had left it full of a beautiful deposit of sodium chloride, gleaming white and apparently pure.

The real center of activity is a quarter of a mile south of this point and on considerably higher ground. Barren sand-hills covered with broken pieces of lava girt a small amphitheater on the west, and low mounds of soft eruptive rock lie between it and the lake. The whole of the mud floor between is hard-dried and rough, gleaming white with salt incrustations and dotted with these mud-volcanoes. Some of the craters are beautifully shaped, running up to perfect cones, like mud beehives or gigantic swallows' nests. I counted some 70 in this plain. Many were quiescent, silent or nearly so. About 15 were very active, filled with boiling mud, which was thrown up to a height of 10 feet. On all sides there was the hiss of escaping gas, the explosive pant of steam blown off through countless orifices, and the rumple and splash of the surging mud. Except for the persecuting "stock flies" and the flocks of water-fowl that flapped and shrieked along the shallow margins of the lake, the whole region seemed absolutely devoid of living things. The print of an Indian's bare foot across the plain startled me with the sudden amazement of a Robinson Crusoe. In the midst of the *salses* was a deep pool of warm water, on the edge of which had been built a rude booth of reeds and a pole ladder that led down into the hole. I tried the bath. It seemed scalding hot, but proved only 118° Fahr. Near by was another clear pool—hot, salty, and nauseating to the taste.

For at least 50 years, and we know not how much longer before Major Heintzelman's discovery, these *salses* have been boiling and ejecting, and the heat that lies beneath them and gives them rise will

not subside for many decades. The volcanoes are doubtless immediately due to the infiltration of water from the Colorado overflow down to the heated beds of rock not far beneath. Converted into steam, these waters burst violently upward through the deposits of silt, and around their orifices throw up encircling walls of mud. The heated condition of the rock formations below the surface would seem to be due to the great delta accumulations here, and would seem to support the mechanical theories of the origin of crustal heat.

COCOPAH WINTER HOUSE AND BASKET GRANARIES — WITH CORN GROWING ON GROUND RECENTLY INUNDATED BY OVERFLOW

From a photograph by the author

Throughout the desert the inundated country produces a most astonishing growth of grasses, wild hemp, and weeds. A variety of tumbleweed (*Chenopodium*) grows to a height of ten feet in a few weeks' time. For months of the summer thousands of acres of the so-called desert are transformed into luxuriant meadows. The Cocopah Indians, who live along the right bank of the Hardy, as well as on sloughs further east and on the lower Colorado itself, raise abundant crops of maize, beans, and melons from the naturally irrigated

soil. As the water slowly retires and leaves a margin of damp soil, the Indian breaks small holes with a heavy pointed stick, at intervals of a few feet, and in these deposits a few seeds. The moisture and excessive heat combine to produce a rapidity of growth that is astonishing. It is the veritable beginning of agriculture, and one may learn here how such cultivation arose in the valleys of the Nile and the Oxus. Two hundred and sixty years ago, when these Indians were first seen by whites, they were planting and harvesting precisely as they do today.

The great meadows of the overflow are utilized in summer and fall by American cattlemen. Thousands of head of stock are driven in as soon as the inundation comes. Below the line and along the Cocopah Valley I saw a magnificent herd of 1,600, the property of San Diego cattlemen, which had been thriving and increasing in that region for several years.

The care of cattle on the desert gives rise to an occupation as arduous and hazardous as exists among human employments. Cattle-punching anywhere in the West is not an easy life; here on the desert of the Colorado its trials and dangers are multiplied. Feed and water become scant in late winter and spring before the overflow arrives; deathly want and scarcity settle down over all the country; the starving cattle grow restless under the grievous want; then comes the overflow, and hundreds of square miles of desert clay become the stickiest surface on the face of the earth. The cattle, miserably reduced and weak, are unable to pull themselves out of the mud in which they sink continually in their efforts to reach food and water. One cannot appreciate what it is to have stock "bogging down" until one has seen them sinking by scores in the bottomless clay of this inundated country. From daylight to dark the cowboy must be in the saddle pulling these foundered cattle out with *riata* and pony. For weeks his skin is hardly dry and his person never free from the thick incrustations of fluviatile mud. Difficulties lessen as the cattle become nourished and grow stronger, but throughout the summer there must be constant watchfulness. These young fellows live on a diet of coffee, baking-powder bread, and jerked beef roasted in the flames. At night they lie down on the ground and seek sleep in the cover of a smudge of cow dung as protection against mosquitoes. The few rude utensils and the stock of grub are packed in cowhide *alforjas* on the backs of *burros*, and the camp is located under the shade of mesquite bushes in some dry spot along a slough, close by the restless herds of cattle.

THE CHINESE PARADOX

By Harvey Maitland Watts

With the envoys at Pekin relieved, the first shock of surprise over, the world naturally inquires as to what infatuate madness led the Manchu conspirators to invite the attack of the great Powers. To the Caucasian mind, familiar with the everyday fact of the puissance and resources of the civilized world when acting as a unit, such an outbreak as that which has concentrated the attention of both hemispheres on China for three months seems an impossibility. To the Chinese mind, however, the attack was the most natural thing in the world, since it was made inevitable, if not actually invited, by the strange paradox of China's diplomatic relations with the outside world.

Explanations of the anti-foreign uprising there are in plenty. Every promoter who has taken tiffin with a taotai, every worldling who has golfed it or played polo at Shanghai, every ex-diplomat who has found his somnolence destroyed by the importunities of the religious enthusiasts, cries out against the missionaries. Not to be outdone, the missionary and the humanitarian publicists the world over declare the material greed of the Powers themselves is the determining cause, and each nation in turn is accused of being the evil genius which added the final straw that was too much for the Chinese camel's back. All these things were factors, it is true, in irritating the Peacock throne, but the cunning determination to kick over the traces, to cast aside all international responsibilities, was due wholly to the fact that by reason of diplomatic errors and oversights in the past China was never brought to realize its true status before the world. To the Chinese mind, the Powers were not the invincible entities which we deem them, but weaklings who had only to be terrorized once and for all, when they would trouble the "Middle Kingdom" no more.

This attitude was the real cause of the uprising, and the Manchu conspirators were able to take this position by reason of the striking fact, the potent paradox of China's relations with the outer world, that while by grudgingly granted treaty China occupied the position of a third-class state whose sovereign rights were limited by the extra-territorial rights of foreigners on its own soil, by imperial etiquette, by official procedure at Pekin, by use of all the artifice of an oriental

court at once childish and devilishly ingenious, the Manchu government was enabled to reverse absolutely the relative position occupied by the Treaty Powers and itself, and was in a position to assume and did assume the attitude of a superior state dealing contemptuously and condescendingly with its feudatories. This anomaly, which the Powers would better never have endured, so paralyzed the exercise of diplomatic relations that normally subsist between great nations that the position of any envoy in Pekin was always more or less impossible, and any insolence on the part of the Chinese always possible; for, arrogant and ignorant as was the Manchu court, it would never have dared to attempt to wipe the slate clean had not Chinese officialdom implicitly believed that the Powers, which for 40 years had allowed their envoys to be treated in a manner beneath the dignity of the states they represented, would not interfere were a drastic anti-foreign movement carried to a bloody success all along the line.

However small Chinese sovereignty was writ at the treaty ports, at the capital it not only saved "its face," but by forcing Europe and America meekly to accept its own vainglorious fictions as to the world—supremacy of the puppet "Son of Heaven," gained a prestige far from empty, in which were infinite possibilities of evil. Advantage was taken of the complaisance of the Powers as to what they considered were non-essentials, but which to the Chinese mind were distinct renunciations of national rights. The envoy who left his home capital in conscious pride that in him was personified the greatness of the country he represented, and that he was the embodiment of a high civilization, woke up in Pekin to find that, though he was surrounded by the revolting sights and smells and discomforts of twelfth century barbarism, by the pervading tyranny of convenient etiquette he was classed as an inferior person and was obliged to carry on diplomatic relations under such social and official disabilities as to cripple his usefulness and paralyze his initiative. Amazed, disgusted, and disgruntled, "cabined, cribbed, confined," his only consolation was that all his associates were in the same boat and had got used to it.

That the present crisis is directly the outcome of this paradox in international relations, events prove. All other causes—religious, economic, political—are secondary. As the feeling of contempt which the position occupied by the envoys invited grew, the reactionaries became bolder, and when they were successful with the *coup d'état* of 1898 and found that western complaisance endured it, they planned

the present outbreak, ingeniously directing the anti-dynastic "Boxer" movement against the foreigners. That too much stress is not laid on this issue, that its significance is not overestimated, is shown by the astonishing fact, revealed in the latest British Blue Book on the Chinese difficulty, that on June 6 last, when the envoys finally realized the ominous situation that confronted them since the Tsung-li-Yamen had practically thrown off the mask, they wasted precious time by a futile discussion as to whether they had a right, not being ambassadors, to demand an audience with the government itself. The spectacle is not a pleasing one. They were the envoys of the greatest nations of the globe. Since January an anti-foreign movement had been gaining ground, connived at by the highest officials in province and capital, and secretly supported by the government itself. The complicity of the government was evident in March. Every member of the diplomatic corps knew he was dealing with an inept and irresponsible government, to which duplicity was second nature, which would only yield to force or the threat of it, and yet so tied up was each man by the red tape of diplomatic tradition that he hesitated over points of etiquette! So humble, indeed, were the ministers in the face of Manchu impudence that all that Sir Claude MacDonald in his terrible dilemma could suggest on June 8 to Lord Salisbury was this:

"There is a disposition on the part of the diplomatic corps to request an audience in order to represent the seriousness of the situation to the throne, but as yet I am not aware whether this step will meet the approval of Her Majesty's government."

A day later the Empress and Tuan decided to kill the legationers; two days more and the women and children were huddled in the British legation compound, and within a week, consequent upon Seymour's failure to get through, the attack on the legations had begun. The envoys, in fact, could hardly have been more helpless had they actually been "tribute bearers from vassal states," as Chinese vanity has not hesitated to dub them. Their inaction, with its fatal consequences, was an echo of the past, and the home governments were equally easy-going. We now see that instead of frittering away precious time in June, all respect for the worn-out fictions of a conspiring piratical government should have been thrown to the winds, the issue faced, and the suppression of the anti-foreign movement demanded. Had this been done we should have been spared subsequent anxieties and the large outpouring of blood and treasure. But the tradi-

tional inertia of diplomatic conservatism that had existed since 1861 was too much for the ministers, and they hesitated, and Chinese diplomacy won the last throw and the reactionaries carried the day, fortunately, however, to their final rout when the might of the outraged nations was thrown against them.

As the Powers have hardly lost sight of the relative facts of the issues involved, this last outcome of 40 years of futile diplomatic attempt to live up to a vain make-believe will never be repeated. The elaborate superstructure of governmental pretense which had its habitation in the Purple Forbidden City has fallen as a house of cards, and cannot be set up again unless the Powers deliberately wish to undo the good work now under way. Whatever may be the final geographic adjustments, open or veiled, there must and will be an end of the diplomatic disabilities of the past. To be effective the readjustments of the foreign relations of China must be indicated by such a definite, unequivocal, visible demonstration of the actual dominance, the actual economic and political superiority of the western Powers, as to make an indelible impression on the imagination of the lay and official classes of China. It is the imagination that controls nations and peoples, and none have known this better than the very officials who under one pretext or another made patent to all Pekin the supposed subservience of the foreign Powers through the studied humiliation of the envoys. The long pupilage of the two boy Emperors, Tung-chi and Kuangsü, whose reigns are coincident with China's diplomatic contact with the West, played into the hands of the court, and hence made it difficult for the Powers to save themselves from a situation which has had its ridiculous as well as its tragic side. The peculiar relations that the nations put up with, it must be remembered, were first established in 1861, and it was not until 1873, after the envoys had been struggling for years with the newly organized Tsung-li-Yamen, purposely made an inferior board and assigned to service outside the walls of the Imperial City, that they were granted an audience with Tung-chi, then but 17 years old. At once the court officials raised the preposterous question of kotouing, though they knew full well no European or American minister would submit to such degrading abasement. Precedent was also against them, as Lord Macartney as far back as 1794 refused to perform the ceremony, and no European in modern times, save the easy-going Dutch in 1664, had yielded this point. No Manchu official expected they would in 1873, but broaching the matter was a part of

their diplomatic game, and, beaten in this, they got even with the Powers, as they view it, by receiving the envoys in the Hall of Tributary States, outside the royal palace.

Again, after Kuangsü came of age and an audience was agreed on in 1890, so little did the Chinese care for the facts of the case that the same hall was used, and, the ceremony being made even more belittling to the dignity of the envoys, they determined as a body never to submit to the imposition again. A few private audiences were held consequently under better conditions in the following years, but it was not until the Japanese war, in 1894, had pricked the Chinese bubble and had driven home a few needed lessons that the imperial government yielded its childish pretensions and received the envoys in the palace itself. The Powers, however, let the humiliation of the intercourse through the Tsung-li-Yamen continue, confirmed Chinese insolence by yielding continually until the collapse of 1898 and the succeeding intrigues—the flat refusal to lease Italy Sanmun Bay in March, 1899, though Italy's demand was supported by Great Britain, being the turning point—convinced the party of the Empress Dowager that it need not fear either united or determined action on the part of foreigners. Consequently the Manchu conspiracy, which had been under way for two years, came to a head in June, to the surprise of the very chancelleries that practically invited it and to the discomfiture of the envoys. Though revealed in imperial decree and forecast in political changes, when the crash came they sat helpless because there was no Gordius to cut the entanglements of the idle ceremonies by whose foolish fetters they felt themselves inextricably bound. They forgot that a paradoxical situation is never so mischievous as when those who know the falsity of its apparent relations accept the surface fact as final. But all this is past, and the Chinese paradox goes to join the august collection of exploded physical and political notions that had their day of evil obsession, but finally yielded to nineteenth century science and nineteenth century sense.

IN THE GORGES OF THE YANGTZE

From Commander Harris Webster's collection of Chinese pictures

ONE OF THE MAIN AVENUES OF SHANGHAI

From Commander Harrie Webster's collection of Chinese pictures

COLONIAL GOVERNMENT IN BORNEO

By James M. Hubbard

It is now more than sixty years since there landed in Borneo a young missionary—not of the Gospel, but of good government. While voyaging in the Indian Archipelago in 1830 he was deeply impressed with the fact that these islands of unequaled beauty and natural resources were peopled with savages continually at war with each other and carrying on piracy on a vast scale. He determined to rescue some of them, if possible, from their barbarism by teaching them to respect and appreciate the value of law and order. And now, nine years after, he had come in a yacht, with a crew of twenty men, to carry out his Quixotic purpose. The time was apparently inopportune, as a rebellion of the Dyaks was in progress, but he offered his aid to the Sultan, and as a reward for his services was made Rajah of Sarawak. His first task after establishing his power was to reform the methods of government, to prepare a code of laws, and to develop commerce as the most effectual means of putting down piracy. He endeavored to make his native subjects understand that the main object of his government was not the commercial exploitation of the country or the amassing of colossal revenues, but the preservation and well-being of the people themselves; that their ruler would be a terror only to the disturbers of the general peace and to the enemies of the commonweal.

How has this strange experiment in ruling men of a low type of civilization succeeded? In attempting to answer this question I will not review the history of Sarawak since 1842, but simply describe the work of one of Sir James Brooke's successors.*

Charles Hose entered the Sarawak civil service in 1884 as extra officer in the Baram district, which had very recently been ceded to Brooke by the Sultan of Brunei. In 1890 he was made Resident, a post which he now holds. The district is about 10,000 square miles in extent, with a population probably not far from 100,000, and the governing staff consists of the Resident and an assistant magistrate—the only white men in the district—and about 20 or 30 Dyak "fortmen" or police. His principal executive duty is to put down murder,

*My information is derived from a paper read before the Royal Geographical Society last March and published in the *Geographical Journal*, and the remarks made upon it by Professor Haddon, the head of the Cambridge Anthropological Expedition which visited Borneo in 1898.

head-hunting, and theft. "If any of the interior tribes do a little head-hunting," says Professor Haddon, "Mr Hose starts away by steamer as far as it can go, then takes to canoes, and when he reaches the people he simply talks to them. They usually give themselves up or pay their fines—400 to 500 dollars for a life taken. What surprises the natives is Mr Hose's activity. He never loses a moment; when there is difficulty he rushes up at once with only a few 'fort-men'; still the people feel that he is a man they cannot tamper with and they give in. It is moral rather than physical force. The people who in the past were inclined to give the greatest trouble are at the present day the staunchest upholders of the government."

His chief aim, however, is "to bring peace to communities whose normal condition was one of mutual hostility." With this end in view he made a journey in 1898 to a hitherto unexplored part of his district to bring about friendly relations between his people and a tribe, the Madang, who have from time immemorial been at enmity with them. When he reached their principal village, consisting of nine long houses, with some two thousand inhabitants, he immediately accepted an invitation to stay with the chief, although accompanied only by hostile natives. These could not enter the houses until all the cases of blood-money had been settled between them. After long negotiations, during which "two men messengers were sent backwards and forwards to discuss the numbers of people killed on either side from time to time, and big gongs, shields, and weapons of all kinds changed hands as blood-money," peace was concluded. At a feast given on the following evening there were "some very good speeches made, their former troubles and differences being explained and discussed in the most open manner. Each chief spoke in turn, and concluded by offering a drink to another and singing a few lines of eulogy, the whole assembly joining in a very impressive chorus at the end of each line, and ending up with a tremendous roar as the bamboo cup was emptied."

The next day the Madangs collected a quantity of rubber for their first payment of tribute to the government, namely, two dollars per family. As there was no means of weighing it, they decided that the leader of Mr Hose's escort and two Madang headmen should act as assessors, and determine whether the piece of rubber brought by each person was sufficiently large to produce two dollars.

"It took these men," says Mr Hose, "the whole day to receive it all, and much counting was done on the fingers and toes. I would

mention that their method of counting is as follows: Some one mentions the names of all the families in each house, and as he does so a man tells each name off on his toes; when five have been counted, another man catches hold of the counted foot, and so on until his feet and hands have all been told off, when another man is used, and this continues until all the names are mentioned, when they halt to see how many men have been used, and where the last one ended." This extraordinary willingness to pay tribute on the part of savages who had never before seen a white man is noticed by Professor Haddon, who says that they pay it "because then they can feel that they are citizens of the Raj, they really do belong to the government, and barbarians are by no means fools. They know well that by paying two dollars a year they will have peace, be able to trade, and have all the advantages of a settled government, and they feel it is really a good investment for their money."

Before leaving, Mr Hose arranged for a similar peace-making between the Baram and Madang chiefs at his official residence, Claudetown. This was done soon after, six thousand natives being present. At one of the meetings a Madang chief "made a very eloquent and remarkable speech, in which he explained that his people had for years been compelled to fight on all sides in order to hold their own, but were now fully able to appreciate the benefits of peace under the Sarawak government and of friendly intercourse and trade with the peoples of the Baram and surrounding districts—a condition of things which he would do all in his power to strengthen." The substantial outcome of this peace-making and the proof of the chief's sincerity was that last year 200 Malay traders went among the Madangs, who had collected large quantities of jungle produce, "and these very people, once so hostile to all, are now being used as a means to bring about friendly relations between our people and the border tribes." As Professor Haddon says, the barbarians are no fools, and native chiefs in the neighboring Sultanate of Brunei have time after time asked Mr Hose to persuade the Rajah to take over their territory, and natives living in Dutch Borneo, seeing how the people of Baram can live in peace and safety, are coming over the border in order to put themselves under the administration of Mr Hose. A few months ago he received a message from the principal chief of one of the most important border tribes, accompanied by a clod of earth, symbolizing the identity of his people with the races of the Baram. "The message he sent (translated literally) was to the effect that his people

were really the same as the Baram people, and that they were on the same soil. They had been divided and made enemies on account of mistakes and the foolishness of unimportant headmen, but he was anxious to meet the Baram people and glad to make peace. He intended visiting us at Claudetown, and if the Baram people wished to trade with the inhabitants of his district, he would be responsible for the former's safety during their sojourn in the Batang Kayan."

The secret of this splendid and almost unexampled success in ruling a savage race is to be found in the fact that "the confidence of the natives has been won and retained by an unbroken record of promises fulfilled and benefits bestowed." Thus they have been educated into the belief that the single aim of their white rulers was their welfare. "Since that belief was firmly established, native public opinion," to use Mr Hose's words, "has always been on the side of the government, and it is on the moral force of that public opinion that the whole framework" of Sir James Brooke's system of government rests. It should be said that the personal influence of the Resident is also an important factor in his success. He speaks six or seven of the Malay dialects—an important matter, for "you can never get at a man's heart if you speak through an interpreter." Professor Haddon testifies to his "wonderful energy and enthusiasm for the natives." He knows personally the greater number of the people of his district. Many come to him with their troubles. "Time after time promising young natives come down on a visit to Mr Hose and stay with him for days or weeks at a time, and in this way the people learn what a white man, a respectable white man, is like and what a government really means. Thus Mr Hose's residence is a sort of university, whither the pupils come from all parts of his district to learn a little as to the meaning of government."

Nor while attending to his official duties is he neglectful of other interests. He has prepared an admirable map of Baram District which has just been published by the Royal Geographical Society. Dr Bowdler Sharpe speaks, in behalf of the British Museum, of the "extraordinary efforts to advance science that have characterized Mr Hose's residence in Borneo. He has crowded into our museum enormous series of mammals, birds, insects, shells, and every kind of animal. Not only has he given to the British Museum the first fruits of his work during his sixteen years' residence in Borneo, but there is not a leading museum in the whole world that has not received collections from this indefatigable young man, second only to those given

by him to the British Museum, and these donations have proved of great importance to the countries he has benefited.' We may add also that this kind of government pays from the lowest material point of view. In 1898 the value of the total trade of the country was $9,174,898, a gain of over 130 per cent in ten years, while the government balance-sheet showed a surplus of $94,682.12.

Charles Hose is the type of ruler over races inferior to the white in intelligence and civilization which England has been assiduously educating for the past hundred years, and it is to her success in this education that the extent and stability of her tropical empire are due. This country is about to undertake to rule people of a similar race and characteristics to those in Borneo. We must raise up men like these Englishmen—men who will found a government of the people for the people supported by public opinion—or we shall fail as utterly as the Spaniards have done.

THE WATER SUPPLY FOR THE NICARAGUA CANAL[1]

By Arthur P. Davis,

Hydrographer of the Isthmian Canal Commission

In the *Scientific American* for February 24, 1900, appears an article by Professor Angelo Heilprin, entitled "An assumed inconstancy in the level of Lake Nicaragua: a question of permanency of the Nicaragua Canal." This article purports to show, from old observations as compared with more recent ones and from theoretic considerations, that the level of Lake Nicaragua has very materially declined within recent years. A very conclusive reply, from a geological standpoint, by Dr C. W. Hayes, was published in the National Geographic Magazine for April, 1900.

In the *Scientific American Supplement* for May 19, Professor Heilprin rejoins with another article, in which he dismisses the arguments of Dr Hayes as insufficient, and attempts to show, from the observations published by the Nicaragua Canal Commission, that, independent of these arguments, the lake has declined 20 feet and 9 inches in level within the last nineteen years. To arrive at this conclusion, Professor Heilprin employs several assumptions in addition to the actual observations taken by the Commission. He gives a table, presumably based upon the report of the chief engineer of the Nicaragua Canal

Commission, page 65, showing a rate of inflow to Lake Nicaragua corresponding to the recorded rainfall at Rivas. This table was constructed by the chief engineer upon an assumption made by me and expressed as follows:

> While we have no conclusive data upon which to estimate the percentage of run-off to rainfall in the basin of Lake Nicaragua, it is well established as a general rule that in any given basin the greater the rainfall in a given time the greater the percentage of run-off, so that if the rainfall were increased 21 per cent the run-off should be increased somewhat more, say 25 per cent.—*Report Nicaragua Canal Commission*, page 295.

It will be seen that this is a mere assumption adopted for the want of any actual data, and, as should always be done in such cases, it is made on the side of conservatism, for the purpose of comparing the rainfall of 1898—the only year for which we have records of the fluctuations of the lake—with other years. If, however, this assumption should lead us into obvious absurdity, it should be modified or rejected, but up to the present time this necessity has not appeared.

The second assumption is that the Rivas rainfall is reliable and bears a reasonably uniform relation to the rainfall and run-off in the basin of Lake Nicaragua. This matter was discussed by me in the Report of the Nicaragua Canal Commission, page 297, where it is shown that the fluctuations are greater in quantity than is usual in other parts of the world, so that if this record is in error, it also is probably on the side of conservatism.

Professor Heilprin's third assumption is that the outflow from Lake Nicaragua in the seventeen years from 1880 to 1896, inclusive, averaged 42 inches per annum. This assumption is entirely gratuitous, apparently with no basis whatever, and, together with his table quoted from the chief engineer, leads Professor Heilprin to the astounding conclusion that the lake has declined 20 feet and 9 inches in nineteen years, or 249 inches. To reach this conclusion he has assumed a total outflow in that time of 798 inches, or 549 inches more than the alleged decline of the lake. A conservative estimate of the water required for the use of the canal is given on page 66 of the report of the Commission, showing that a liberal allowance for leakage, lockage, and power requires three inches annually from the surface of Lake Nicaragua, or a total of 57 inches for the nineteen years. When the canal is constructed provision will be made for storing the run-off from Lake Nicaragua so far as necessary, and Professor Heilprin's own figures show that 549 inches will be available where only 57 are required,

leaving 492 inches as a margin of safety. This is a coefficient of safety of about 9½, which ought to be regarded as exceedingly liberal.

As an actual fact, no one knows what was the discharge, either maximum, minimum, or mean, from Lake Nicaragua prior to 1898. We do know, however, that the San Juan River has been navigated for a period much longer than the Rivas rainfall record, and that always, within the last generation or more, it has been necessary to transfer freight over the rapids during the dry season and unnecessary to do this during the season of high water. These facts are based not only upon the testimony of such intelligent men as Hon. W. L. Merry, former superintendent of the transit company and now United States Minister to Nicaragua and Costa Rica, but upon the existence of the light-draft steamers and lighters used for these purposes at that time, which fully bear out the testimony that the regimen of the San Juan River, and therefore of Lake Nicaragua, has not materially changed within the memory of men now living.

If the conclusions drawn by Professor Heilprin are correct, Lake Nicaragua has been only a short time at its present stage, but in this alleged short time it has made a very marked and decided beach throughout the extent of its western coast. How, then, did it manage to leave absolutely no record of its stage twenty or thirty years ago?

But the crowning absurdity involved by Professor Heilprin's theory is that the old Spanish fortifications at Grenada, the wharf, warehouses, and a part of the city, as well as several villages and hamlets around the lake, must have been all constructed under water, since they are now less than 20 feet above the lake level.

It is a curious fact that, in order to clinch his argument and show that there is no probability of a recurrence of very wet years to make good the alleged loss from the lake, Professor Heilprin triumphantly quotes from Dr Hayes as follows: "So far as known, there is no evidence whatever that the rainfall has ever been greater in this region than it is at the present time." This quotation is employed at the close of an article which purports to show conclusively that the water supply to Lake Nicaragua *has* very greatly declined within a generation, and that therefore there *is* conclusive evidence that the rainfall has been greater in this region than it is at the present time.

MRS BISHOP'S "THE YANGTZE VALLEY AND BEYOND"*

By Eliza Ruhamah Scidmore

In these two volumes Mrs Bishop relates incidents of her travels in China during the years 1896 and 1897, including visits to Shanghai, Hangchau, and Ningpo, and along the regular tourists' route up the Yangtze to the head of steamer navigation and the Gorges. Mrs Bishop pushed on beyond this scenic region to Chingtu in Szechuen province, and from that western center went on to the wild mountain region to the northwest of it, where she encountered the mysterious Man-tze, people of another race, differing from the Chinese entirely, some forgotten Aryan offshoot. At this furthest interior point this intrepid woman-traveler traversed a district where no European had ever gone before, even the ubiquitous Jesuit missionary not having visited those villages.

It is a record of the direst discomforts and hardships that any woman ever deliberately encountered and willingly endured. The wonder grows, as one reads, that she should have remained in the province, should have followed her itinerary to the end, as she had planned it. Only escape from prison, or from an enemy's country in war time, would seem warrant for such repetitions of fatigue and exposure, with the barest necessaries of subsistence, under the most revolting conditions. For months Mrs Bishop slept in the worst rooms of the worst of Chinese inns, often adjoining and over the pigsty, and sometimes in it, and always obliged to take every precaution against the vermin swarming and the filth dripping from every side. Privacy, quiet, cleanliness, proper food, and baths were as impossible for her as for the Chinese, who have no need or longing for such luxuries. Often she went shivering to bed in wet clothes, often the roof leaked and storms blew in upon her, and once she went to bed when the winds and drafts in her bedroom blew out the candle. Tea and a bowl of wheat flour stirred up in boiling water constituted her breakfast, cold rice or a nibble of chocolate her luncheon, and dinner was a modest course of rice with curried meats or chicken. She lived on this fare during the months spent in small native boats and in a chair borne by coolies over the busy roads of Szechuen. Mrs Bishop did not travel in the conventional closed sedan chair of the country, but rode in an ordinary wicker armchair fastened to poles, as is shown in one of the illustrations.

When she discovered that such open travel was contrary to etiquette and custom, attracted unpleasant attention, and left her at the mercy of street crowds and mobs, Mrs Bishop did not abandon it, but valorously continued to run dangers the ordinary male traveler might avoid. Every indignity and discourtesy was put upon her by her boatmen at the start, and continued by coolies and street crowds throughout Szechuen province. All of Chinese rudeness, hostility, brutality, and insult was vented on this quiet, kindly disposed

*_The Yangtze Valley and Beyond._ By Isabella L. Bird (Mrs Bishop), F. R. G. S., author of _Unbeaten Tracks in Japan, A Lady's Life in the Rocky Mountains, The Hawaiian Archipelago_, etc. With map and 116 illustrations from photographs by the author. 8vo, 2 vols., pp. 410, 365. New York: G. P. Putnam's Sons. $6.00.

traveler, but, although often disenchanted, she did not turn back nor abandon any part of her contemplated tour. As she wore Chinese woman's dress, with a Japanese jinrikisha coolie's hat, and European russet leather shoes under straw sandals, she naturally attracted attention and drew crowds of the curious; and Chinese mobs, not respecting her sex or her gray hair, pursued her savagely at times. "Child-eater" and "child-stealer" were the names shouted most often, and the cries of "Kill her!" and "Burn her!" were voiced in many a Szechuen city. Twice the mob pursued her into hiding places, pried open and battered down the doors, and Mrs Bishop had often to sit in some dark and noisome hole, revolver in hand, waiting for the last moment to come. Once a stone struck her and left her senseless and bleeding in her chair, and she suffered the effects for many weeks. Chinese officials tried to discourage and prevent her visiting remoter Szechuen, but she pushed on and on, into more hostile regions, encountering fresh assaults, more discomforts, hardships, filth, and horrors of every kind. The true traveler's spirit seems to have possessed her, and one would hardly look for greater zeal in a missionary seeking martyrdom for the sake of spreading the faith, or in an explorer who had happened upon an unknown country, discovered a new race, or found mines of fabulous richness. Marco Polo, Abbé Huc, and many travelers have written of the Szechuen country and the borderland of Tibet, but Mrs Bishop's narrative is the latest and a most interesting one, and she repeats all their praises of the scenery and fertility of that province.

Trade problems and statistics are woven in with the narrative, and as Mrs Bishop was everywhere the guest of the missionaries, one has a very clear picture of the mission work that is carried on in the far interior under conditions that would discourage any but the truest, most earnest Christians. She speaks encouragingly of the progress and results of mission work, and her testimony is the ablest and most appreciative that can be offered. Mrs Bishop struggles earnestly to make out a good case for the Chinese, to prove them a great and admirable people; but some of her experiences were too much for her plan of praise, and her readers easily understand when she says: "China, with its crowds, its poverty, its risks of absolute famine from droughts or floods, its untellable horrors, its filth, its brutality, its venality, its grasping, clutching, and pitiless greed, and its political and religious hopelessness, sat upon me like a nightmare." One follows less easily when she alludes to "a certain loveableness about the people"—the repulsive people, whose lack of all kind or admirable traits is shown so clearly in her daily life of travel.

After one frightful experience at the hands of a mob, Mrs Bishop complained that "these rows are repulsive and unbearably fatiguing after a day's journey, and always delayed my dinner unconscionably, which, as it was practically my only meal in the day, was trying." Also, "The mannerless, brutal, coarse, insolent, conceited, cowardly roughs of the Chinese towns, ignorant beyond all description, live in a state of filth which is indescribable and incredible, in an inconceivable beastliness of dirt, among odors which no existing words can describe. I wondered daily more at the goodness of people who are missionaries to the Chinese in the interior cities, not at their coming out the first time, but at their coming back, knowing what they come to."

Again says Mrs Bishop: "When night came, and I sat shivering in some fetid hole, not fit for a decent beast, with only a bamboo railing between it and the pigsty, I often thought Chinese traveling an utter abomination." And her readers fully agree, wondering the more with each page and chapter that Mrs Bishop should have remained in the midst of such abominations, when not driven and held to it by any vow, or contract, or obligation—enduring it all voluntarily, traveling in such ways, in such well-beaten tracks, for pleasure and interest only. "The interest of mixing in any fashion with the people far outweighed the discomfort of peasant accommodation, even when it was pretty bad," she says, and then mentions that "seven pigs occupied a depression railed off in one corner" of the room she occupied that night.

One has to regret that Mrs Bishop's literary skill should be spent upon such unpleasant subjects, such repulsive people and incidents, for the pictures are all too clear and realistic. Mrs Bishop saw with the keen, trained eye which notes and grasps every feature and detail, and she puts it before one as a strong, sharply cut photographic print. Every extenuating circumstance is made the most of for the benefit of the brutal, insolent people; not a tree, plant, or flower escaped her, and the rocks, and stones, and soil were equally observed. There was magnificent mountain scenery as she went further west toward the snowy range, and her descriptions are charming, full of color and vivid reality. The cost of this independent travel was not great, seven shillings a day being the average of chair travel and wayside accommodations. Everywhere she encountered poppy culture and opium smoking, and the chapter devoted to the opium poppy at the end of the narrative is one of the most interesting in the book. Mrs Bishop at the close expresses the kindest and most hopeful sentiments for the Chinese, doubts that the break-up or the decay of the empire has come, and sees some hope of the awakening of this enigmatic race.

The city of Shanghai is of nearly the same latitude as Mobile, Alabama, Morocco, and Alexandria, Egypt, and in climate and luxuriance of plant life much resembles these western cities. The town lies at the southeastern end of a wide plain, the Kiangsu province, which has often been described as "the garden of China." In the variety and wealth of its fruits and vegetables it is not unlike southern California. From the neighboring fields, rice, grain, and cotton have been the principal crops, but of late the demand for cotton and the good prices offered for that staple by the mills recently built at Shanghai by foreign capital have induced the farmers to give up the cultivation of rice and grain and plant cotton instead. Shanghai is the commercial center of the most densely populated section of the empire, 500 to 800 inhabitants to the square mile being a fair estimate of the density of the population. The imports in 1898 of this city reached $90,000,000, thus exceeding in value the entire imports of the rest of the empire. Canals, rivers, and creeks, penetrating in all directions, converge toward Shanghai, affording easy communication for hundreds of miles. Twenty-five years ago the river opposite the city was about 1,800 feet broad at low water, but today cannot exceed 1,200 feet. The depth of water on the bar, averaging only 19 feet and rarely reaching 23 feet, causes much loss to shipowners because of the detention of steamers.

FOREST RESERVES OF THE UNITED STATES

In the United States today 70,761 square miles of territory—that is, an area considerably greater than the combined area of the six New England states—have been dedicated by Congress for forest preservation. Most of this land is rugged and mountainous, and hence of little value for cultivation, but especially fitted for tree growth. The splendid work being done by the U. S. Geological Survey to determine the resources of the Forest Reserves is graphically described in the recently published official reports for 1897–'98 and 1898–'99 of Mr Henry Gannett, Chief of the Division of Geography and Forest Reserves of the Survey.* Of this immense area, wild and in places almost inaccessible, more than one-half has been scientifically explored. The density of timber, the variety of wood, the amount of merchantable timber, the burned areas, the land reforesting and the land on which trees are not springing up again, the quality of the soil—all these and many similar facts that must be ascertained before the reserves can be properly developed have been carefully examined and noted. The condition of woodlands in different states has also been investigated. As a result many impressive facts have been gathered.

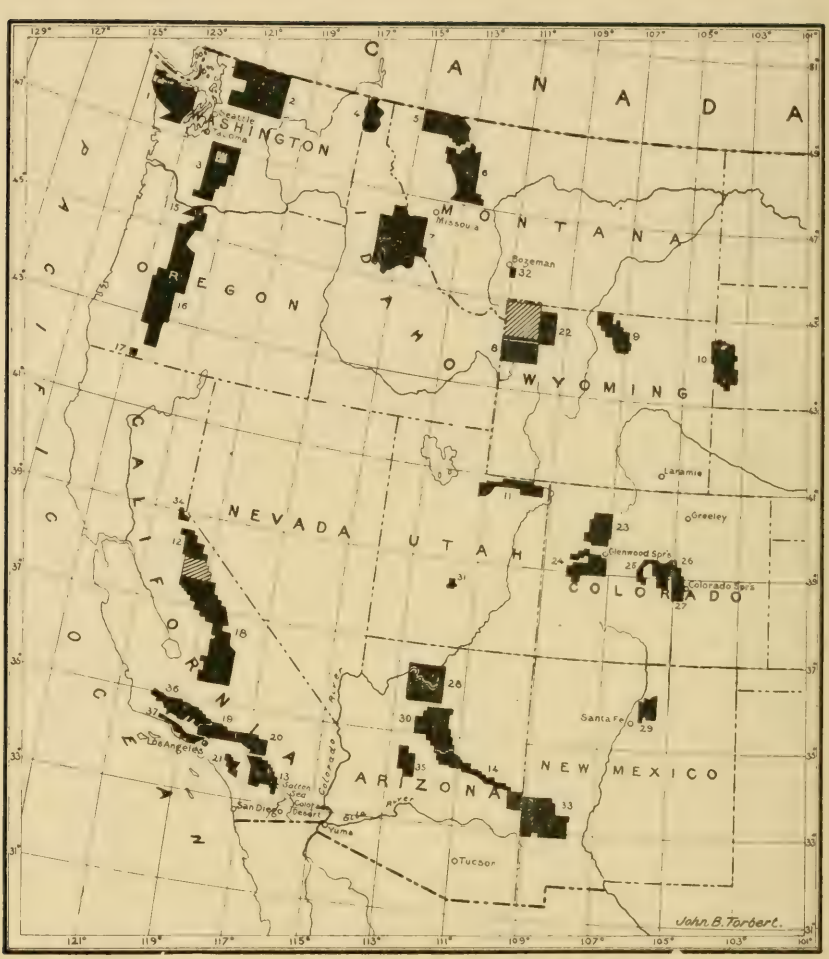
In the state of Washington the forests are among the densest, heaviest, and most continuous in the United States. The trees have a thickness of 12 to 15 feet, and are, as a rule, 250 feet high, their trunks often shooting upward for a hundred feet without a branch. Mr Gannett estimates that since lumbering began in the state 36,000 million feet B. M. have been cut; but within the same period, or less than a generation, 40,000 million feet B. M. have been destroyed by fire. Thirty million dollars have thus been lost to the people of the state.

The report for 1898–'99 forms a sumptuous volume of 498 large octavo pages, handsomely illustrated with 200 pictures from photographs. Twenty-seven maps of the different reserves and, in a separate pocket, eight larger maps, show by gradations of color the classification by land, etc. In addition to the general report of Mr Gannett, there are included special papers by John G. Jack, George B. Sudworth, H. B. Ayres, and John B. Leiberg. A more detailed review by Mr Gifford Pinchot of the volume for 1897–'98 follows.

Perhaps the most notable forest publication of recent years is the fifth part of the Nineteenth Annual Report of the U. S. Geological Survey. This volume is the first fruits of a study of the national forest reserves that has been conducted by the U. S. Geological Survey since 1897. It contains, besides special reports on ten reserves and a note on the timber of Pine Ridge, Nebraska, an article on "The Forests of the United States," by Henry Gannett, Chief of the Division of Geography and Forestry, under whose direction the work has been carried out. It is with Mr Gannett's article alone that I wish to deal in this note.

* *Nineteenth Annual Report of the U. S. Geological Survey, 1897–'98.* Charles D. Walcott, Director Part V. Forest Reserves. By Henry Gannett.

Twentieth Annual Report of the U. S. Geological Survey, 1898–'99. Charles D. Walcott, Director. Part V. Forest Reserves. By Henry Gannett.



No.	Name.	Area in sq. miles.
	Afognak (Alaska)	
17*	Ashland	29
24*	Battlement Mesa	1,341
9*	Bighorn	1,762
7*	Bitterroot	6,480
10*	Black Hills	1,893
14	Black Mesa	2,592
15	Bull Run	222
16†	Cascade	7,020
31	Fish Lake	106
5*	Flathead	2,160
32	Gallatin	63
33	Gila	3,636
28	Grand Cañon	2,893
34	Lake Tahoe	213
6*	Lewis and Clarke	4,572
3*	Mount Rainier	1,655
1†	Olympic	3,006
29	Pecos River	673.5
27*	Pikes Peak	288
36	Pine Mt and Zaca Lake	2,569.6
26*	Plum Creek	280
35	Prescott	662
4*	Priest River	1,008
20*	San Bernardino	1,152
30	San Francisco Mts.	1,524
19*	San Gabriel	868
37	Santa Inez	227
13*	San Jacinto	1,152
18	Sierra	6,400
25*	South Platte	1,068
12*	Stanislaus	1,080
8*	Teton	1,296
21	Trabuco Cañon	78
11	Uinta	1,368
2*	Washington	5,616
23*	White River Plateau	1,872
22†	Yellowstone	1,936
	Total	70,761

* Examined by U. S. Geol. Survey.

† Examined in part by U. S. Geol. Survey.

Since the publication of Sargent's monumental volume in the Tenth Census and the gradual but inevitable recognition of the fact that his results were by their very nature subject to extensive revision, estimates of forest area and of standing timber in various portions of the United States have been frequently repeated. So far as the present writer is informed, a very large majority of these estimates have been altogether guesswork. Mr Gannett's paper, on the contrary, is based on a complete compilation of the available facts. We have here a statement of the wooded area and merchantable stand of timber in the United States based on definite sources of information. A remarkably skilful use has been made of old data and an immense amount of new information, supplied to Mr Gannett either by his own fieldmen or by railroad companies and other holders of timber lands, is now published for the first time. The use of the old and new together has rendered possible what is by far the best statement yet made of the forest condition of the United States.

Under the head of "Wooded Areas, by States," following a brief introduction, there is given an admirable summary of the total land area and the total wooded area of each state, with a statement of authority in every case. These figures show that the United States has now 37 per cent of its total area in wood, or, in round numbers, a million square miles. Contrasted with previous estimates, which have usually been about 25 per cent, this estimate is extremely satisfactory.

It is unfortunate that the description of the merchantable standing timber in the United States cannot be made as complete as that of the area of woodland. Mr Gannett has compiled, however, all the information which has been gathered, and the result is a table of the first interest. There follows a discussion of the consumption of timber, which reaches an annual value of about $800,000,000, an amount slightly in excess of the mineral production of the country. The enormous progress of the lumber industry in the northwest is illustrated in a tabular view, which indicates that in 1870 the value of the lumber product of Washington was worth about $1,000,000; in 1880, about $2,000,000, and in 1890, about $15,000,000.

Mr Gannett's paper concludes with synopses of the reports included in the volume, of which those on the forest conditions in the states of Washington and Oregon are especially noteworthy. To reach an estimate of the stand of timber in the former state, Mr Gannett made or collected and compiled actual timber cruisings of more than a million and a half acres, and is consequently in possession of a body of facts altogether without parallel. He gives tables of the stand of merchantable timber, the logged area, the naturally bare area, and the burned area, together with definite figures for the stand of timber for each of the timber counties. A summary of these tables shows that more than 114 billion feet are now standing. Another most significant result is that within recent years 20 per cent of the merchantable timber of the state has been burned, or enough to supply the whole United States for two years. In Oregon the timber area is larger and the stand per acre heavier on the average than in Washington, the actual merchantable stand being estimated at 235 billion feet. Fires have been but little less destructive here than in Washington.

The value of Mr Gannett's report consists as much in its method as in its

matter. Here is a statement of definite facts and of conclusions drawn from them in clear and simple words, marking a new step in the statistics of forests in this country. Undeterred by the evident paucity of information, and with a degree of skill of which I cannot speak too highly, Mr Gannett has given us the best there is in the most practical form. He has had the coöperation and assistance of an admirable corps of men in his own division, of whom Graves, Sudworth, Ayres, and Leiberg are of national reputation in forestry, but he has succeeded in obtaining results from other sources so extensive that without them his work would have been altogether impossible. To the men who have supplied these results, and especially to Mr Thomas Cooper, of the Northern Pacific Railway, it is but fair to acknowledge our debt.

GIFFORD PINCHOT.

THE GREAT WALL OF CHINA*

The great wall of China was built at a time when the wild tribes of northeastern Asia were pressing forward into the lowlands, whither their kinsmen had gone centuries before. It most probably consisted originally of a line of detached earthworks, which some able ruler or captain strengthened and connected so as to present an unbroken line to the public enemy. It is said to have been finished 205 B. C. by Tsin Chi-Hwangti, and to be nearly 1,600 miles long. The Chinese call it the "Ten-thousand-li wall," and if it really had any such length, it would be something over 3,500 miles long.

It is from 25 to 30 feet high, 15 to 20 feet thick, and revetted, outside and in, with cut-granite masonry, laid in regular courses, with an excellent mortar of lime and sand. It is surmounted by a parapet or battlement of gray burned brick 18 or 20 inches thick, covered with moss, and pierced with crenelated openings for the defenders, whether archers or matchlockmen, to fire through. The rear or inner revetment wall is also furnished with a lower parapet, but it is not crenelated. The top is paved with a double layer of brick about a foot square. The inside of the wall is made of earth and stone well rammed in. Every 200 or 300 yards there is a flanking turret 35 or 40 feet high, projecting beyond and overlooking the face of the wall in both directions, and near each turret is a stone staircase leading down between the walls to a door opening upon the ground to the rear.

The most astonishing thing about it is, however, that it climbs straight up the steepest and most rugged mountain sides, courses along their summits, descends into gorges and ravines, and, rising again, skirts the face of almost inaccessible crags, crosses rivers, valleys, and plains in endless succession from one end of the empire to the other—from the seashore on the Gulf of Pechili to the desert wastes of Turkestan. No spot is left unguarded or uncovered, and, no matter how fierce and active were the wild tribesmen who assailed it, or how innumerable were their armies, it is evident that it could, if well defended, even by men armed with nothing better than stones, defy the world up

*From *China*, by James H. Wilson. New York: D. Appleton & Co.

THE GREAT WALL OF CHINA

From Commander Harrie Webster's collection of Chinese pictures

to the day of gunpowder and artillery. It is laid out in total defiance of the rules of military engineering, and yet the walls are so solid and inaccessible, and the gates so well arranged and defended, that it would puzzle a modern army with a first-class siege train to get through it if any effort whatever were made for its defense.

The simple problem of cutting the stone, making the brick, and transporting them to the wall must have been a sore puzzle to those who had it in hand, and it is almost impossible to conceive the means by which the water used in making the mortar could be carried to the mountain tops across such a rough and arid country. It is, of course, known that the movement which crystallized itself in that way was a national, if not a popular, one, and that it was carried through by contingents of men from the various provinces, the men being paid and subsisted by the provinces to which they belonged till they had finished the task assigned them.

GEOGRAPHIC NOTES

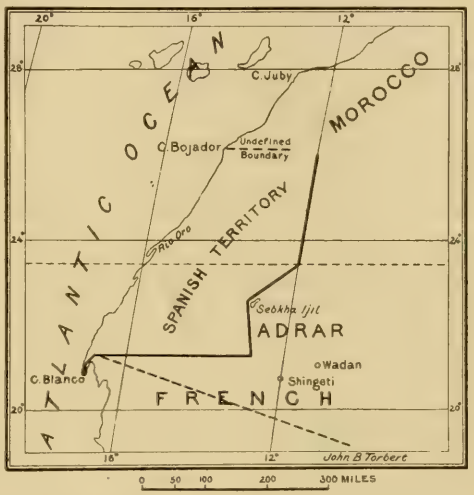
France has of late become somewhat alarmed at the invasion of Tunis by thousands of Italian farmers and peasants, which if continued will endanger her commercial and political supremacy in central north Africa. It is estimated that in the last two and a half years no less than 10,000 peasants from Sicily and southern Italy have entered the country. They have for the most part acquired and settled upon land along the main routes to and not more than 150 miles distant from the capital, Tunis. The French in Tunis, including soldiers and their dependents, do not exceed 30,000.

Notes on China, a brochure issued by the Adjutant General's Office of the War Department, is a condensed compilation of many facts of interest about the Chinese Empire. The Chinese Army, the permanent military organization, the provincial militia and irregular forces, the forts and arsenals, and the Chinese Navy are well described. A brief description of 20 cities that for strategic and political reasons are most prominent is also appended. A valuable feature of the book is a map, on a scale of two and a quarter miles to the inch, of the Peiho from Taku to Pekin. Persons desiring copies of the report should apply to the Military Information Division of the War Department.

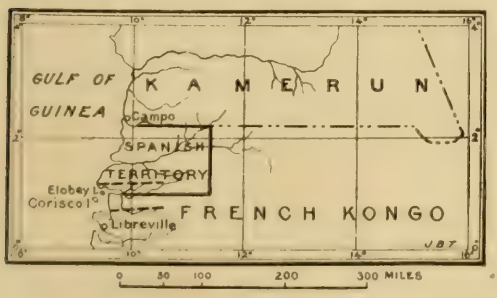
Dr Nansen is at present with Dr Johan Hjort in the *Michael Sars* cruising in the Arctic Ocean. The object of the trip is to study the habits and migrations of the cod and to take hydrographic observations in a portion of the Arctic Ocean between Spitzbergen and Iceland that has never been mapped. Although Dr Nansen has no official position in the expedition, it is understood that he will conduct the hydrographic researches. The *Michael Sars*—named after Dr Nansen's father-in-law, a professor of "fishology"—was built and especially equipped for the Arctic Ocean by the Norwegian government. The expedition sailed some weeks since from the southern part of Norway in a northwesterly direction. Between the Shetland Islands and Iceland Dr Hjort hopes to locate new cod banks and to discover the spawning place of these fish. Then the

ship will sail northeast, and Nansen will conduct his researches between Iceland and Spitzbergen and endeavor to supply the missing link which will connect his work on the *Fram* with that of earlier Norwegian and British investigators.

SEVERAL changes in the map of Africa were made by a convention signed between France and Spain on June 29. In 1885 the Spanish seized the northwest coast of Africa from Cape Blanco northward to about Cape Juby. They gave their new possession the name of Rio de Oro, after a bay thus christened by the Portuguese in the fifteenth century, though neither gold nor a river were to be found there. The following year they pushed into the interior and signed a treaty with the people of Adrar, but they did not inform the European powers of the treaty. In successive years Adrar was overrun by French explorers and thus fell under French influence. By the terms of the convention now concluded, the boundary runs from Cape Blanco in a straight line eastward to about 13° longitude, thence to the northwest around Sebkha Ijil, a dry salt lake, then due east to the 12th meridian, which it follows to Morocco, where it becomes indefinite, as the boundary between Morocco and Rio de Oro is not defined. The territory in northwest Africa credited on current maps to Spain is thus considerably reduced by the convention.



Projecting into French Kongo is a small bit of Spanish territory. Spain has always claimed that her rights extended further into the interior, almost to Ubangi, but with the exception of the islands Elobey and Corisco she has never exercised any jurisdiction over this land. France has never recognized the title of Spain to any of the mainland, and on French maps only the islands Elobey and Corisco are given as belonging to Spain. By the terms of the new treaty, however, Spain acquires about 1,000 square miles, the northern boundary of her possession touching German Kamerun. France gains the privilege of purchasing the piece if Spain ever desires to be freed of it.



While with every other quarter of the world the export trade of the United States is increasing at a phenomenal rate, with South America it has remained almost stationary since 1890. In 1890 the United States sent goods to the value of $38,752,648 to that continent, but during the twelve months, July 1, 1899–June 30, 1900, the value of goods exported thither reached only $38,945,721—that is, in the last ten years the value of the export trade to South America has increased less than half of one per cent; this, too, notwithstanding the good work of the Bureau of American Republics, founded in 1890 "for the prompt collection and distribution of commercial information concerning the American republics." The exports of the United States to the nations of Europe during 1899–1900 show an increase in value of 52 per cent over the exports of 1890, their value in the fiscal year just ended being $1,040,167,312, as against $683,736,397 in 1890. The export trade with Asiatic peoples has in the last ten years increased 229 per cent, being valued at $19,696,820 in 1890 and $64,913,984 in 1899–1900, while the exports to Africa were $4,613,702 in 1890, and are now $19,469,109, an increase of 321 per cent.

The four great facts in the foreign commerce of the United States for the year ending June 30, 1900, as summarized by Mr O. P. Austin, are:

1. The total commerce of the year surpassed by $317,729,250 that of any preceding year, and for the first time in the history of the United States exceeded two billion dollars.

2. The exports exceeded those of any preceding year, and were more widely distributed throughout the world than ever before.

3. Manufacturers' materials were more freely imported and formed a larger share of the total imports than ever before.

4. Manufactured articles were more freely exported and formed a much larger share of the total exports than in any year since the United States became a nation.

It is a strange coincidence that the world's production of gold during the last half of the nineteenth century should exceed the output during the first half in the ratio of "16 to 1." In figures the production for the fifty years ending with 1899 was $6,596,832,000, as against $787,460,000 for the preceding fifty years. The production of gold during the last half of the nineteenth century was also more than double that during the 360 years following the discovery of the American continent, the total output from 1492 to 1850 being $3,159,230,000. In 1899, for the first time since the phenomenal production of the California mines in 1853, the amount of gold mined in the United States, including Alaska, exceeded the production of that record year. The gold mined in the United States last year was valued at $72,500,000, or seven and one half million dollars more than in 1853.

The comprehensive dictionary of the Natick (Indian) language of Massachusetts, on which the late James Hammond Trumbull spent many years of labor, is to be published by the Bureau of American Ethnology. With the exception of the famous Eliot Indian Bible, this is the most interesting and valuable record of the language of the Indians of New England.

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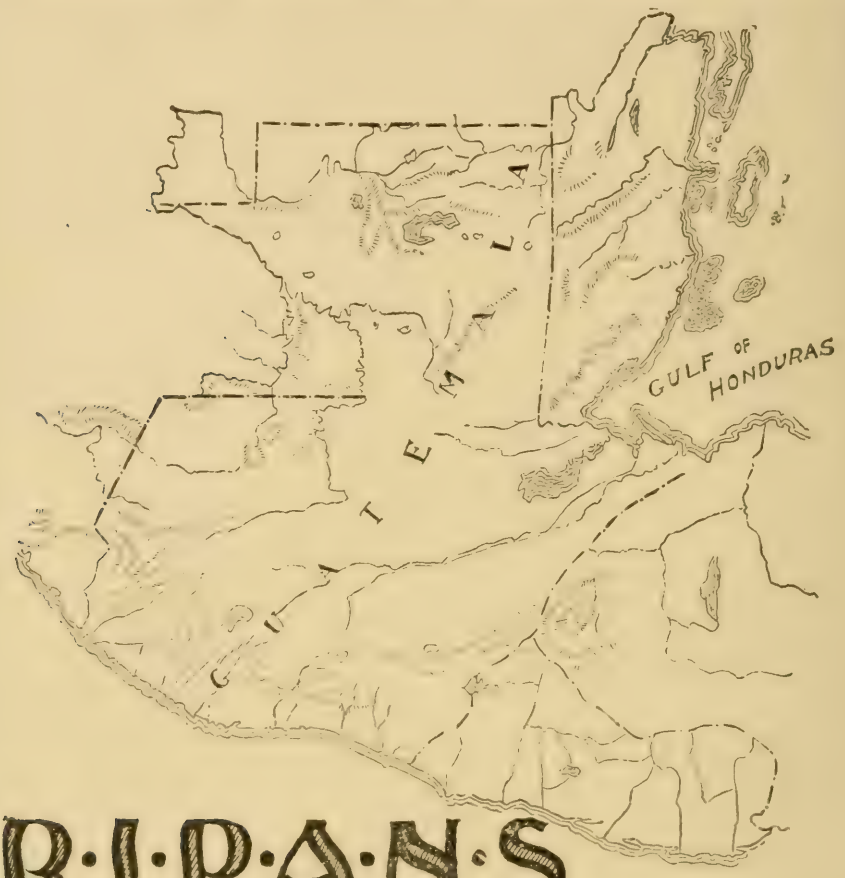

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THE LESSONS OF GALVESTON

By W J McGEE

Formerly Geologist in Charge Coastal Plain Division, U. S. Geological Survey

The darkest horror of American history has fallen on our southern coast; a city comparable in population and wealth with Ephesus and Sodom of old, with Herculaneum and Pompeii of appalling memory, and with earthquake-wrecked Lisbon of later centuries, is blotted out in a night. Thirty-eight thousand people, the life and soul of a progressive and thriving city, are overwhelmed and doubly decimated by wind and wave in the darkness; literal thousands are crushed in their own falling houses or drowned in the raging waters; every survivor is made homeless, and most of them are utterly impoverished. The morning's sun rises on a scene of suffering and devastation hardly paralleled in the history of the world—a scene which has been, and will be again and again, described by tongue and pen, but never in more than a fraction or suggestion of the ghastly details. Out of the awful chaos spring the twin progeny of catastrophe, begotten of the best and the worst of humanity—Heroism, clad gloriously in helpfulness and self-abnegation, and Ghoulism, shrouded vilely in cowardice and unholy greed. For many hours the disaster is secluded by the very extent of its wreckage, but the next day brings sympathy and substantial aid in a measure unequaled in the annals of nations: the great State of Texas is stirred into noble activity; hard-pressed Federal officials turn promptly from grave political and international problems toward the stricken city on the coast, while literal millions of fellow citizens spring to seek means of contributing to the alleviation of the lot of the sufferers. Viewed as a physical phenomenon, the destruction of Galveston was a moving spectacle; viewed in its effect on human sympathy, it was sublime beyond all precedent.

Several lessons of the Galveston horror are well worth reading and pondering:

The first lesson is the old, old one of experience summed in parable, which bans the building of a house on sand. Galveston was founded on a sand bank—a mere wave-built cay or key—made by the waves of average storms during a few centuries. Up to its highest point (less than a dozen feet above low tide) the earth of the island comprised absolutely nothing but wave-cast sand and silt, and to a depth of at least half a mile in vertical measure there is no solid rock; the strata are loose sands and silts and mud beds, nowhere firm enough to afford a sure foundation. Geologically the deposits are those of the Pleistocene Columbia formation to a depth of several hundred feet, and these are underlain by lithologically similar deposits of several Tertiary formations. The successive formations from the Columbia downward are mechanical deposits; they are not cemented with calcareous or silicious substances, like some of the formations of the eastern Gulf coast, nor are they bound together by coralline masses like some of the West India littorals; they include little material save water-logged muds and silts, semi-solidified by pressure at depths, but nowhere lithified into firm ledges. And what is true of Galveston is measurably true of the entire western Gulf coast from Vera Cruz to the Mississippi passes; no worse coast-stretch for foundations exits in the world, and none other so bad is of anything like equal extent.

The second lesson is but the first raised from the plane of experience alone to that of recognition of natural agencies: The sand bank on which Galveston was built is something more than a simple heap of silicious grains and dust; it is a record of past wave-work which might well have deterred the founders of the city. The most conspicuous work of waves and wind-driven sea-currents is the building of bars of sand or gravel gathered from neighboring shore-stretches or washed up from shallow bottoms; only less conspicuous is the work of these agents in carving sea-cliffs. Both modes of work are preëminently characteristic; there is not a mile of our eastern and southern coasts, from St Croix River bounding Maine to the Rio Grande beyond Texas, without one or the other of these products of sea-work. On some coast-stretches, like that of southern New Jersey, the bars and sea-cliffs alternate, the one stretching across the mouths of valleys embouching toward the sea, the other truncating the divides between the valleys; along higher and rockier shores, like those of

New England, the sea-cliffs predominate; but along the flatter coasts, like most of those along the Gulf, the bars—the keys of the vernacular—predominate, and are commonly separated from the mainland by sounds; so that everywhere the character of the shore is determined primarily by its height above tide, secondarily by the work of waves and sea-currents in building bars and carving cliffs. Now the important point in connection with the bar or key is the fact that it is built by waves aided by the currents, so that its height and breadth afford a fair measure of local wave-work—not of the idle ripples of the calms, not even of the breakers of lesser storms, nor yet of the great hurricanes happening by at intervals of centuries, but of the greater storms of current decades. So the crest of the key marks the reach of the great but not phenomenal tempest, and its seaward slope gives some indication of the frequency of such storms, the steeper slope attesting a more frequent wave-work; while the effect of the century-rare typhoon is rather to destroy than to build symmetric keys, such as those skirting our Gulf coast and some stretches of the Atlantic shore thence northward. Other factors, including customary tides and prevailing winds, affect this sea-work; but they are subordinate. Thus, the elongated key on which the city of Galveston stood was but a natural storm-record; and it was merely by chance of weather history that she so long survived.

It is the business of the engineer and architect to look to foundations, and to avoid the traditional house on the sand; but it is the duty of the nature student to interpret natural records and guard against the building of houses within reach of storm waves—still more against building on the storm-records themselves. Fortunately the students of nature are now legion; the geologists and physical geographers from Harvard and Stanford, Columbia and Cornell, Yale and Chicago, and a score of other institutions of modern learning are diffusing actual knowledge with unprecedented rapidity; even the more progressive public schools, like those of Washington during the last lustrum, are substituting real knowledge for the husks of learning, and inculcating ideas of nature-work which will be of inestimable value in guiding the location of cities and bridges, railways and moles, with proper regard to natural conditions—and it is not too much to hope that every citizen of this enlightened land may soon be able to interpret such simple and self-evident nature-products as storm-built bars and keys, and that if he sees fit to build a wharf or erect a warehouse on a storm-record he will do so with his eyes open,

with clear knowledge of the risks involved, and with due precautions for the safety of the helpless and dependent in his own family and others.

There is a third lesson, less simple than the first and second, but far too important to be neglected: it is the lesson of coast subsidence, already learned by Holland and Helgoland, and now forcing itself on Louisiana and Texas as well as New Jersey. The student who scans the shores of Atlantic and Gulf, either on the ground or on the admirable maps of the Coast and Geodetic Survey and the Hydrographic Office of our Navy, soon perceives that the relations between wave-built bars and wave-cut sea-cliffs vary from coast-stretch to coast-stretch. On the New Jersey coast the bars are beaten well back to or beyond the line of the sea-cliffs, so that the ponds or sounds behind the bars are relatively short and discontinuous; along the Florida coasts the keys stand farther out to sea, and are separated from the mainland by great elongated sounds often affording navigable waterways; while about the northern shores of the Gulf the relations of the keys to sounds are more variable. Closer study serves to interpret these variable relations: from Florida westward to Mobile Bay the keys are nearly continuous and the sounds long and narrow; thence westward to Lake Borgne the typical keys are lost, though their lines continue in a series of islands—Ship Island, Horn Island, Cat Island, etc.—separated from the mainland by the broad Mississippi Sound; still further westward a new series of keys, erratic in form and trend, appears in the Chandeleur Islands, and beyond the delta there is a corresponding (and correspondingly erratic) series of low keys stretching westward nearly or quite to Atchafalaya Bay. Now, the mainland shore of Mississippi Sound is marked by a series of small and narrow keys and sounds, evidently in process of growth, but much less advanced than those east of Mobile Bay; and these are among the evidences that along this stretch of shore the Gulf has encroached on the land to such an extent as to leave the original keys 20 to 40 miles behind. Similarly the Chandeleur keys and the corresponding series west of the delta are small and new and obviously connected with the delta building. But west of Atchafalaya Bay the coast is characterized by the absence of keys and sounds, save of the infantile sort, like those of the inland shore of Mississippi Sound; so that this shore seems incongruous with the rest, until the student discovers the long line of completely submerged keys—Sabine Bank, Trinity Shoal, Ship Shoal, etc.—in a position precisely corre-

sponding to the islands south of Mississippi Sound and forming a direct submarine connection (save as cut off by the delta) between these islands of the eastern Gulf and the well developed keys of the southern Texas shore. The position of these banks, like that of the Horn Island and its fellows, is such as to demonstrate that the waters have invaded the mainland, and that west of the delta the encroachment has been sufficient not merely to push back the shoreline 50 to 100 miles but to completely submerge the ancient keys. The most striking feature of these drowned and half-drowned keys is their symmetric arrangement; except for the interruption by the delta (with its new and lesser sand banks), the great bars form a sweeping curve regular as the beach line of a land-locked bay, and hence afford a rough measure of the outbuilding of the delta as well as of the invasion of the Gulf on its flanks. Hardly less striking than the symmetry of the series is the closeness of continuity between keys and banks; and it is a significant fact that Galveston Island is the northeastern terminus of the west-coast system of keys, the last stretch of these sand banks still rising above the level of tide.

It is the business of the geologist to detect and weigh the evidences of subsidence or elevation of coasts and to estimate the rates of movement for the guidance of local residents and investors; and it behooves such citizens to avail themselves of the scientific researches. The observations on the rise and fall of various coasts are impressive: Holland derives its name from its subsidence, coupled with the building of dikes for the protection of the land; the Island of Batavia, inhabited in the days of Tacitus, is drowned; Zuyder Zee was formed by an invasion of the sea about the end of the 13th century, and the Netherland polders (or dike-protected lands) are maintained only by artificial embankments which have been raised from generation to generation until now cultivated fields lie 7 to 10 meters below tide level. The measure of the rate of subsidence of the Holland coast ranges from .09 to .75 meter per century; since 1732 the mean has been .26 meter, or nearly a foot, per century. The subsidence of the New Jersey coast was estimated at two feet per century by State Geologist Cook; it has continued so long that fresh-water cedar swamps have been submerged and the forests imbedded in saline mucks, whence it is a profitable business to mine the logs for lumber; and in consequence of the current sinking the Atlantic is encroaching and swallowing or destroying estates and homes to the value of many thousand dollars annually. The subsidence

of the Gulf coast is less confidently known; but the geologic indications are that it is (at least between Mobile Bay and Galveston Harbor) nearly as rapid as on the New Jersey coast, and more rapid than on the Netherland coast, at least since the building of the dikes; so that the rate cannot justly be estimated at less than a foot per century. Naturally this rapid subsidence has resulted in other catastrophes it were folly to forget: Witness the swallowing of L'Isle Derniére, a health and pleasure resort of New Orleans, with most of its transient population—"the wealth and beauty of the Creole parishes"—just 44 years before Galveston; witness, too, the record of personal observation on the Louisiana coast by the brilliant word-painter Lafcadio Hearn: "The sea is devouring the land. Many and many a mile of ground has yielded to the tireless charging of Ocean's cavalry. Far out you can see through a good glass the porpoises at play where of old the sugar cane shook out its million banners, and shark fins now seam deep water above a site where pigeons used to coo. . . . Grand Terre is going; the sea mines her fort, and will before many years carry the ramparts by storm. Grand Isle is going, slowly but surely; the Gulf has eaten three miles into her meadowed land. Last Island has gone!" Witness, also, Engineer Corthell, the successor of Eads in some of the most remarkable engineering enterprises of the century (in this Magazine, volume VIII, 1897, page 352): "On Belize Bayou . . . stands an old Spanish magazine, built over 200 years ago. At the time of building the jetties at the mouth of the South Pass [1877] this magazine was . . . standing perfectly level, but with the surface of the water stretching across the arch which crowned the entrance door, the sill of which must have been at least 10 feet below the water. . . . Nineteen years later a part of the structure had been removed, but enough of the roof and arches remained to show that the subsidence had continued steadily . . . at about the same rate as during the preceding 200 years. It may be stated that this rate . . . is . . . about one-half of one-tenth of a foot per annum." And let it not be forgotten that of all localities on the Gulf coast Galveston is most exposed; it is the last of the great natural embankments of the west coast remaining unsubmerged, and hence is open to a wider range of gales than any other; it is the point of contact between opposing forces, the land-subsidence on the one hand and wave-building on the other hand, just as was Sabine Bank in its day—but, like that bank, it is bound to be overwhelmed by

one of the few great forces of nature to which human ingenuity and strength must bow.*

These physical lessons are hard—but they are needful.

There is a fourth lesson, which is human; and it is soft and pleasant and promising as the physicial lessons are cruel and gloomy. When the stricken city cried out in anguish, her appeal was met as was no other appeal in history; within a few hours fifty million hearts were touched, and five million fellow-citizens either sent, or sought for means of sending, sympathy enriched by substance. Evidences of the perfect solidarity of a nation united by the enduring bonds of liberty and equality were not wanting before; but it remained for the city of Galveston, the State of Texas, and the first Republic of America to produce the world's brightest example of charity growing out of the community of citizenship. Nor was the wave of sympathy broken at our shores; within a few hours more, messages from the leading nations of the earth proved that the appeal had echoed around the globe, and demonstrated the solidarity of nations and the unity of all mankind in a manner unprecedented in history. Galveston taught the costly but profitable lesson that the city no longer lives unto itself, like Memphis and Athens and Rome of old, but forms an integral part of a nation; that its successes and failures, and the consequences of its wisdom or folly, fall not alone on its own citizens but are shared by millions of men; and that, just as every city is entitled to appeal for sympathy, so it is morally bound to guard against disasters which wring the heart of a nation.

The makers of Galveston erred in building their houses on the sands, in planting their city within reach of the waves, in domiciling their helpless ones on a sinking coast; they have been forgiven their error, more fully and freely than ever were city-makers before; but it behooves them to remember, as they turn toward the future, that charity should not be strained, and that their fellow-citizens have the right to be spared the shock of the inevitable disaster which would follow rebuilding on their devastated sand-bank.

*The subsidence of our coasts has been treated more fully elsewhere. Cf. "The Gulf of Mexico as a Measure of Isostasy" (American Journal of Science, vol. xliv, 1892, pp. 177–192); "Encroachments of the Sea" (Forum for June, 1890, pp. 437–449); and "The Lafayette Formation" (Twelfth Ann. Rept. U. S. Geol. Survey, pp. 347–521).

THE WEST INDIAN HURRICANE OF SEPTEMBER 1–12, 1900

By E. B. Garriott,

Professor of Meteorology, U. S. Weather Bureau

The United States Weather Bureau at Washington will shortly issue a bulletin on West Indian hurricanes, which contains a chronological record of more than four hundred tropical storms. The record begins with a storm which visited the island of Cuba May 19–21, 1494, and describes many of the great hurricanes which have swept the Antilles and the Atlantic and Gulf coasts of North America during the last two hundred years. It is a recital of appalling disasters on land and sea, and presents as its crowning horror the hurricane which caused a loss of more than 5,000 human lives and a destruction of property to the estimated value of $20,000,000 at Galveston, Texas, September 8, 1900. A detailed description of this hurricane can be given only when more complete reports are received from points along its path. Sufficient data are, however, at hand to permit a summary of its more prominent features. The track of the hurricane and the general meteorological conditions which attended it on the mornings of September 5, 8, and 11 are shown on the accompanying charts.

The presence of a disturbance in the vicinity of the Windward Islands of the West Indies was indicated by reports of the closing days of August. During the first three days of September this disturbance moved westward over the Caribbean Sea, and on the night of the 4th recurved northward over west-central Cuba. By the morning of September 6 its center had reached the southern Florida Peninsula. Thus far in its course the disturbance had followed a normal path, and its only notable feature was excessive rainfalls in Jamaica and eastern Cuba. During September 6 the storm made an abnormal recurve to the westward, increased in intensity, and caused severe gales from the western Bahamas over Florida. Passing westward over the Gulf of Mexico, the storm center reached the Texas coast late in the afternoon of September 8, where it recurved northward and passed directly over Galveston a fully developed hurricane.

The maximum wind velocity recorded at Galveston was 96 miles an hour from the northeast at 6.15 p. m., 75th meridian time, and

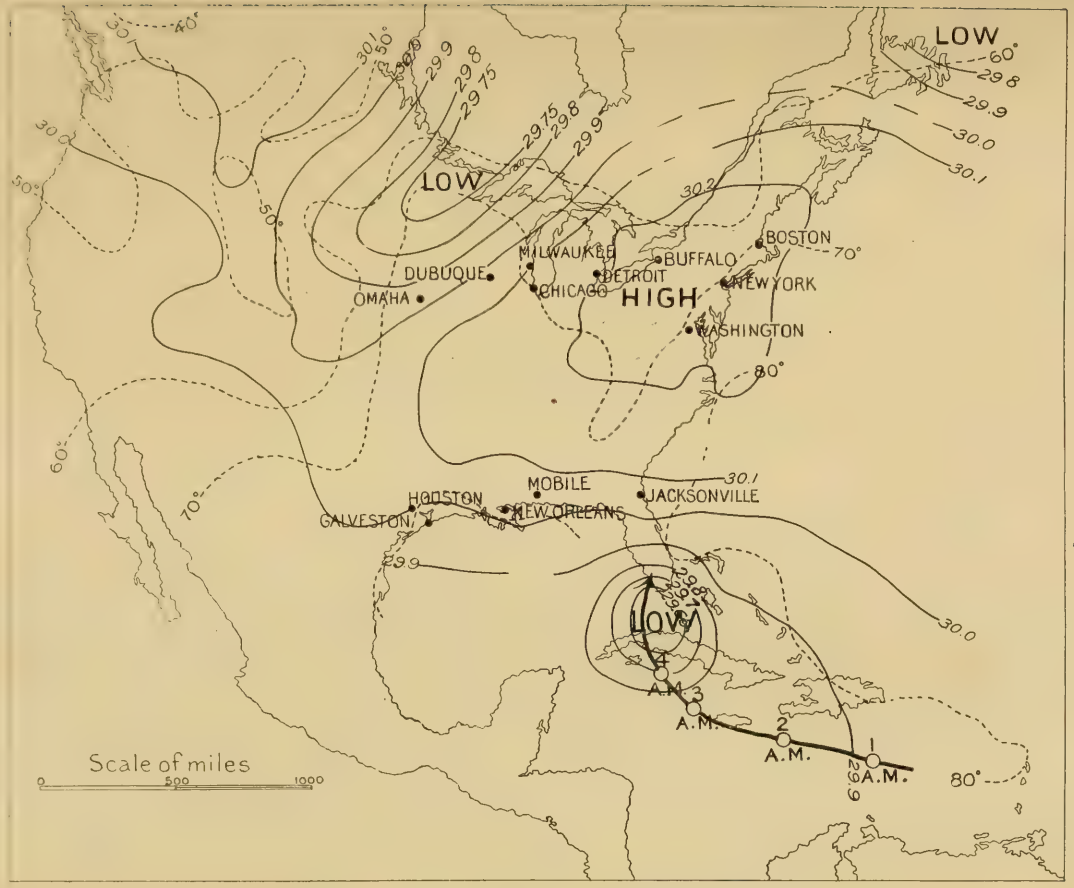


Chart No. 1. Showing Track of West Indian Hurricane, 1900

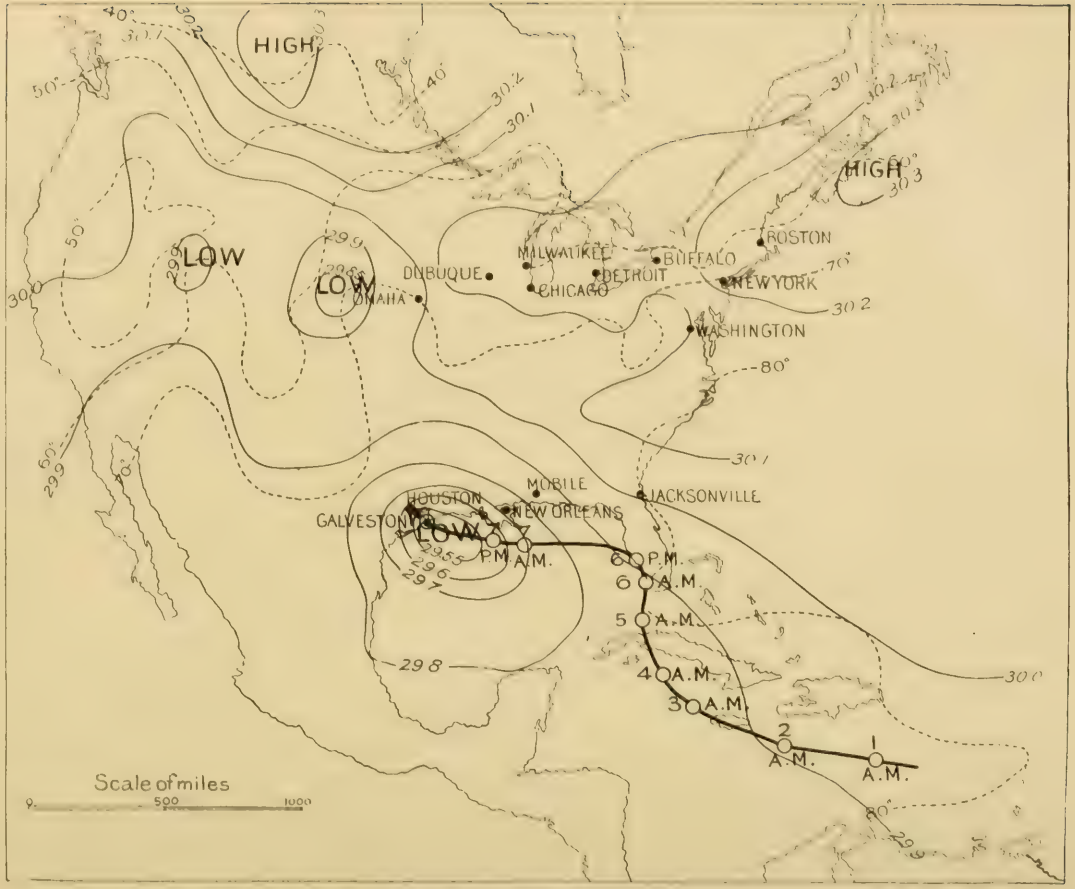


Chart No. 2. Showing Track of West Indian Hurricane, 1900

the observer reports a greater velocity from the southeast after the anemometer had been blown away. The lowest barometric reading indicated by the barograph was 28.53 inches at 8.10 p. m., 75th meridian time, at which hour the vortex of the hurricane passed Galveston. The tide, which came in rapidly during the afternoon and the early portion of the night, covered the entire city to a depth of six to fifteen feet, and swept the southern and eastern portions of the city entirely away. The water began to subside slowly at 11 p. m. of the 8th, and by the morning of the 9th high portions of the city were dry.

Following its northward recurve, the disturbance advanced northward over Texas, Oklahoma, and eastern Kansas, and arrived in Iowa the morning of September 11. During its passage over the interior of the country on the 9th and 10th, the storm was unattended by violent winds, and its entire dissolution was probably averted by the advance of a low barometer area from the northwest, which recruited its waning forces. Thus strengthened, the storm under discussion passed eastward over the Great Lakes and the St Lawrence Valley and thence over Newfoundland, constantly increasing in intensity. It then disappeared beyond the region of observation, having described a charted path more than four thousand miles in length.

As satisfying descriptions of storms require a reference to the meteorological conditions which appear to contribute to their normal and abnormal movements and cause the varying degrees of intensity exhibited, the following statement of these conditions, made by the writer some years ago, is presented:

The recurve of storms in the West Indies and over the Gulf of Mexico is dependent on general meteorological conditions, and more especially on the distribution of atmospheric pressure. The anticyclonic or high pressure area of the North Atlantic Ocean lies northeast of the West Indies, and causes east to northeast winds over the Southern Atlantic Ocean and the Caribbean Sea. These are the northeast trade winds. The storms that develop in the region east of the West Indies, and also those of a more western origin, have a tendency to follow the course of the main equatorial current over the Caribbean Sea. This course is doubtless largely influenced by the general drift of the atmosphere in that region, and, following the anti-cyclonic circulation of winds, the hurricanes skirt the western quadrants of the Atlantic high area, and, carried by the main atmos-

pheric currents, follow paths which recurve north and northeastward near the southeastern coasts of the United States. As a majority of the hurricanes traced have followed the course indicated, it may be considered the normal course of West Indian storms when the usual meteorological conditions obtain over the Atlantic Ocean and the United States. Some of the more important storms of the West Indies have not recurved northward, but have moved westward over the Gulf of Mexico and dissipated over Mexico or the southwestern states. In such cases persistent high barometric pressure to the northward covering their normal line of advance has apparently prevented a recurve.

Observation has shown that storms are commonly more violent in the region where they recurve or attempt to recurve abnormally. Observation has also shown that when the advance of a storm is obstructed and it is held back by an area of high pressure, it acquires greater intensity on assuming an abnormal course. Among notable storms of this class may be mentioned the hurricane of August, 1886, which totally destroyed the city of Indianola, Texas, and the hurricane of September, 1888, which raged with destructive violence over Cuba. These storms were apparently unable to recurve owing to high barometric pressure to the northward. Forced westward, they developed intense energy and dissipated, one on the southeast slope of the Rocky Mountains and the other over Mexico.

It will be observed that the storm of September, 1900, made two rather sharp abnormal turns in its course, and that manifestations of increased energy attended these recurves. It will also be noted that while the storm was most intense on the Texas coast, it exhausted its energy at that point and did not again become formidable until after its union with the northwestern disturbance. The scene of the first of these recurves was the southern Florida Peninsula, and the date was September 6. A reference to the chart of the morning of the 5th will show that the future course of the storm was not clearly indicated by the conditions thereon presented. The middle and north Atlantic coast districts were covered by an extensive area of high barometer, and an area of low barometer was crossing the northwestern states in an easterly direction. The apparent activity of the northwestern low area and decreasing pressure east of the Mississippi River indicated a probable path northward along the Atlantic coast. It was also evident that excessive speed on the part of the northwest depression would result in a failure on its part to dissipate

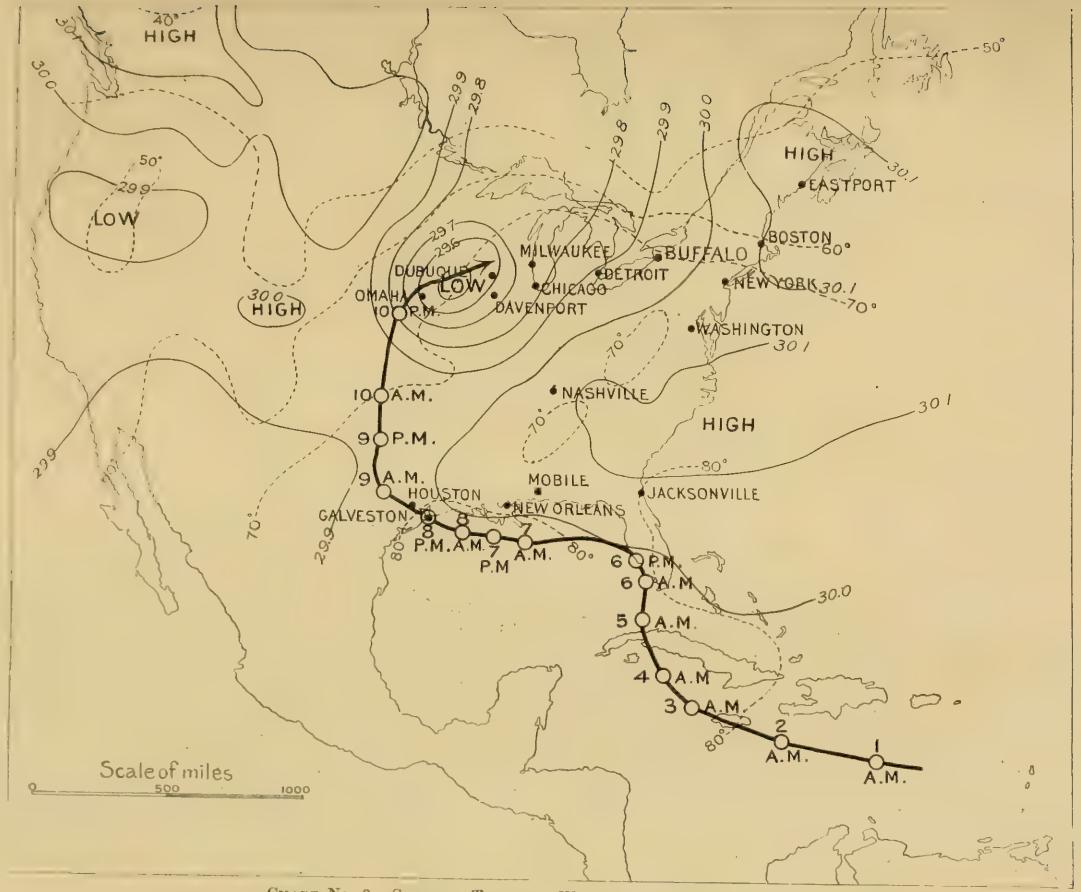


Chart No. 3. Showing Track of West Indian Hurricane, 1900

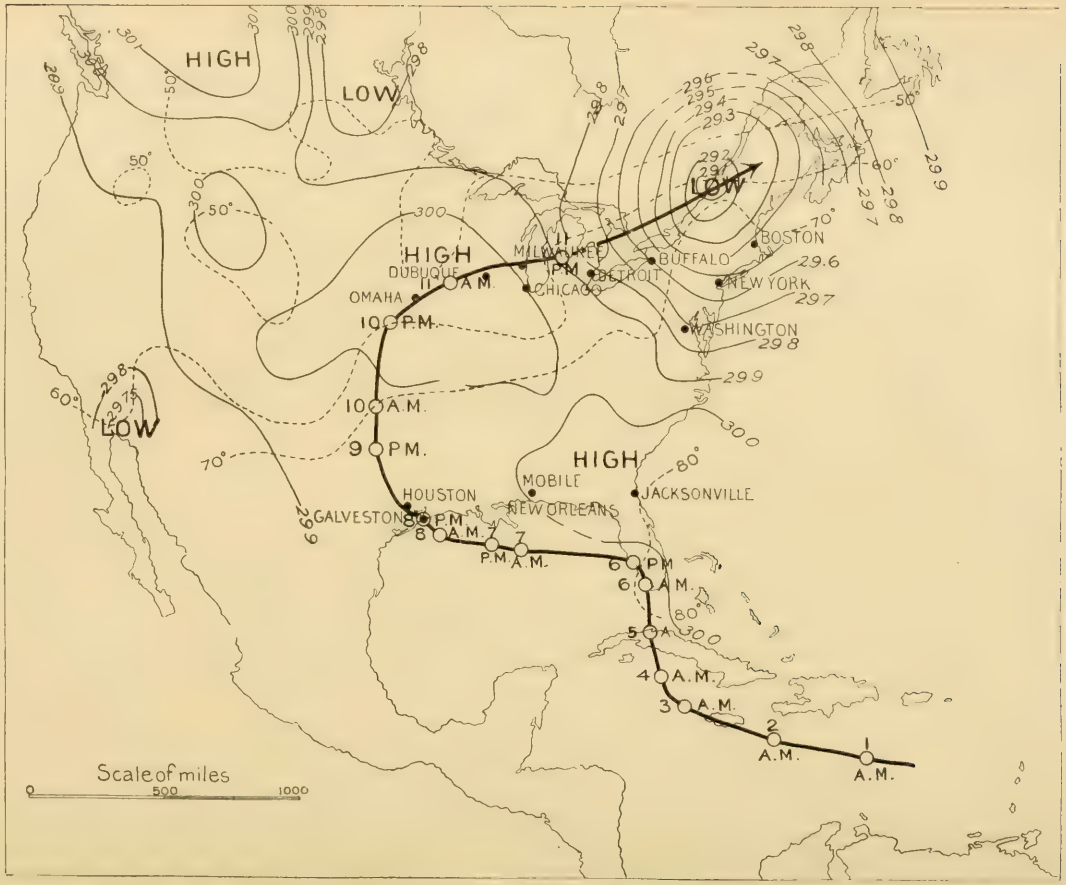


Chart No. 4. Showing Track of West Indian Hurricane, 1900

the Atlantic coast high barometer area and favor a rapid eastward advance of the area of high barometer which occupied the Northwest. It was recognized that these movements would prevent an opening for the storm along a normal line of advance and would cause it to assume a westerly course over the Gulf of Mexico. The chart of the 6th shows that the latter assumption was the correct one, and the reports of the following day failed to show a favorable opening for a northward course over the middle Gulf districts.

On the morning of the 7th the storm was central south of the mouth of the Mississippi River, and reports from Gulf coast stations furnished evidence of its marked strength and subsequent course. But neither these reports nor those of the morning of the 8th indicated a coördination of storm energies which would overwhelm Galveston Island with waves of unprecedented magnitude from both the Gulf and the Bay.

The principal agent of destruction at Galveston was water from the Gulf of Mexico and Galveston Bay. The wind, which doubtless exceeded a velocity of 100 miles an hour, was chiefly important as a cause of the high seas. During the afternoon of the 8th, the highest tide ever experienced at Galveston began to run in from the Gulf *against* the wind. This was a storm wave impelled by the advancing hurricane. Simultaneously waves from Galveston Bay, driven by a northerly gale, covered the inner side of the island.

From available information it appears that the hurricane reached its maximum intensity and the water its greatest depth about 8 p. m., 75th meridian time. After the passage of the hurricane center the wind shifted to southeast and south, the storm waves from the Gulf began to subside, and the upheaved waters of the Bay, meeting the shifted wind, were returned to the place from whence they came.

The geographical position and the topography of Galveston Island render it, in the presence of severe storms, peculiarly subject to inundation. In common with all low-lying districts on the coasts of great bodies of water, it has occasionally been covered by high tides which have been caused either by onshore gales of unusual severity or by waves which have run ahead of the vortex of a hurricane. On September 8 both of these causes contributed to the overflow of the island. The storm wave from the Gulf, combined with the influence of the gale which swept over thirty miles of water surface in the Bay, heaped water from both the Gulf and the Bay over the long narrow strip of sand which composes Galveston Island. The floods thus

produced exceeded by eight or nine feet any previous flood which has visited the city of Galveston, and the almost irresistible force of the enormous waves, together with the strength of the hurricane winds, resulted in a disaster which is without a precedent in the history of the United States.

Assuming that the reading of the barometer reported at Galveston the evening of the 8th was approximately correct, the hurricane at that point was of almost unparalleled severity. The future possibility of a like visitation in that locality is extremely remote.

EXCAVATIONS AT NIPPUR

Many important discoveries have been made during the past eleven years by various expeditions excavating in Babylonia under the auspices of the University of Pennsylvania. Nippur has been identified with ancient Calneh, mentioned in the Book of Genesis (chapter x, verse 10), and the history revealed of Babylonian civilization during a period more than seven thousand years before Christ; but the present year has witnessed the most extensive and valuable discoveries yet made.

These discoveries are three: The library of the great temple at Nippur has been located and opened. Seventeen thousand tablets covered with cuneiform writing have been taken out, and Professor Hilprecht, the able leader of the party, asserts that 150,000 additional tablets are waiting to be uncovered. These tablets are of special value because of their national character; upon them are written the myths and tales of the ancient wars of the Babylonians and their rules of language, of mathematics and astronomy. The library was of great renown in early Babylonia; it was their great college of law and religion.

Under 70 feet of rubbish, the accumulations of as many centuries, Professor Hilprecht found in the southwestern section of the city a palace with 600 feet frontage, probably the dwelling of the priest kings of Nippur. In the rooms excavated, pre-Sargonic tablets, seal cylinders of the earliest type, and clay figurines were found. The walls of Nippur were uncovered for several score yards, and everywhere, especially in the lower strata, weapons of curious devices were unearthed, showing the methods which besieging armies used in those ancient times.

HUNAN—THE CLOSED PROVINCE OF CHINA

By William Barclay Parsons

Of the eighteen provinces which constitute the Chinese Empire proper, the only one which until recently had not been explored or mapped by foreigners was the province of Hunan, extending from the Yangtze to the Nanling Range, or between the 30th and 25th parallels of north latitude and between the 109th and 114th meridians of east longitude, a province with an area of about 80,000 square miles and an estimated population of 21,000,000. Since the subject of the development of the interior of China has been considered, the province of Hunan has been regarded as one of the great objectives of the railway and mining promoter on account of its well-known wealth in coal and other minerals, the fertility of its soil, and the superior ability of its people. The people themselves, however, are the most clannish and conservative to be found in the whole empire, and have succeeded in keeping their province practically free from invasion by foreigners or even foreign ideas.

In 1871 Baron Richtofen, the great German geologist, to whose investigations we owe the greater part of our knowledge of the geological structure of China, made a trip from south to north across Hunan to report on the coal areas of the province to the Shanghai Chamber of Commerce; but his journey was confined wholly to boat travel, and therefore the information that he obtained was very limited. Three years previous to this Raphael Pumpelly, the American geologist, had attempted to explore Hunan by proceeding by boat up the Siang River from the Yangtze, but he was not allowed to land, and finally was forced by the people to turn back after having reached, but not entered, the capital of the province, Changsha. In 1878 Mr G. J. Morrison, an English engineer, traveled from north to south across Hunan by boat, as he also was prevented from making the journey on foot.

In the winter of 1898–'99, the writer, retained as chief engineer of the American syndicate holding a concession for a railway from Hankau to Canton, accompanied by a staff of American engineers, undertook to conduct a survey from Hankau to Canton through the province of Hunan and, of course, by land. In this attempt he was entirely successful, making an instrumental survey for the entire distance—a

length of line, as actually run, of 742 miles—together with reconnaissance work for about 300 miles more. As the result of this survey he has been able to delineate the Siang River and the striking features of the geography and topography of the eastern part of the province of Hunan, and present the first correct map for at least the main drainage line of the province.

MAP OF EASTERN PART OF HUNAN AS DELINEATED BY WM. B. PARSONS.

The province is watered by two streams—the Siang and the Yuan. They meet at the northeastern corner of the province and flow into the Yangtze, forming the most important tributary that the Yangtze receives from the south. The Yuan, the lesser of the two, rises in the province of Kuichau, flows easterly across the northwestern corner of Hunan, and joins the Siang in the Tungting Lake, a large area which in the winter time is dry, except in the beds of the channels of the two streams, which are cut in the alluvial soil to a depth of about 20 feet. In the summer time, when the river rises, this whole area is flooded, forming the lake. The Yuan, with its tributaries, drains, approximately, 27,000 square miles, or about one-third of the province, the remainder being drained by the Siang. The Siang rises in the southwestern part of Hunan, flows in a general northeasterly direction, and drains the north slope of the Nanling Mountains, which form the watershed

between the Yangtze and the China Sea. When reaching latitude 27° N. the Siang River makes a bend at an angle of about 45°, and thence flows practically due north to its junction in the Tungting Lake with the Yuan and with the Yangtze.

The route projected by the American concession through the province of Hunan was a north and-south line following the Siang from the Yangtze to the point where it makes the bend above mentioned. Here the Siang receives a tributary flowing from the south, the Leiho, which, with its tributary, the Yutan, rises in the Nanling Range itself. This watercourse is not only the main drainage line of the eastern part of the province, but is the great trade route of Hunan, communication in the interior being confined chiefly to the rivers. The projected railway route leaves the Siang at its junction with the Leiho and follows the latter to within a mile of Chenchau, then, after crossing the Nanling Range at Parson's Gap, follows the Wei and Pei Rivers to Canton.

At the outlet of the Tungting Lake is Yochau, a city of about 40,000 inhabitants, recently declared a treaty port where foreigners may reside. Yochau has attained its importance by being at the junction of the Siang and the Yuan rivers with the Yangtze, and so becoming the gateway of the province. One hundred miles up the Siang is Changsha, the capital of the province, and consequently the official residence of the governor and the other provincial officers. This city has a population of at least 500,000, and the Chinese claim 1,000,000 for it. It is a walled city of the first class, with considerable manufacturing industries in furniture, pewter-ware, and paper, and although heretofore foreigners have been expressly forbidden to enter it, its shops are filled with all kinds of foreign as well as Chinese goods. Thirty miles above Changsha is Siangtan, stretching along the west bank of the Siang for a distance of three and one-half miles. Siangtan is at the head of large junk navigation, the river shoaling rapidly above this point. It is therefore the distributing point for the central part of the province. The ancient city is small, and within its walls are located the official yamen and other similar public buildings. The modern city of Siangtan lies wholly without the walls, and is given over entirely to commerce.

One hundred and ten miles above Siangtan is Hengchau, at the point where the Siang River makes its bend from its easterly to its northerly course. The Chinese claim for Hengchau a population of 200,000. As the available depth for boats in winter is here again

seriously reduced, compelling transfer from medium-sized junks to *sanpans*, the city has become the great market for the southern part of Hunan.

These cities mark the four great trading points in the eastern part of the province, the most populous and flourishing portion. But there is one more that should be added to the list as a place of commercial importance, namely, Changte, on the Yuan, the head of large junk navigation on that stream.

The accompanying map, the result of a careful instrumental survey, locates the Siang River and the junction of its various tributaries from the Tungting Lake southward to where it receives the waters of the Leiho, and thence the Leiho and its tributary, the Yutan, to the Nanling Range. The location of the river itself and also of the principal cities on its banks is also given. It is almost unnecessary to add that the position of the various details differs considerably from the preconceived location.

The Siang River, like all other streams in China, is subject to an annual rise in the spring, the high waters occurring in May and June and the low period in December and January. During the latter months a depth of only three feet is the most that can be counted on as far as Siangtan, this depth being governed by frequent shoals. Between Siangtan and Hengchau junks must draw not over one and a half feet. On the Leiho the draught of water is limited to one foot to Yungshing, and above that point only the small sanpans are able to ascend in the winter time to Chenchau. In the summer time the flood waters will give a depth of from 10 to 30 feet above the low-water stage.

Although the flood occurrences of the Siang are similar to those of the Yangtze, the character of the stream is quite different. The alluvial nature of the Yangtze Valley soil practically terminates at the south side of the Tungting Lake. From that point southward the Siang River flows through a rocky or gravelly soil formation, so that its waters, unlike those of the Yangtze, are clear. It is a stream that might be improved for navigation purposes; but such work would require a large amount of initial dredging and then a continual annual expense in the same kind of work to maintain a channel. After this was accomplished it would be subject to the annoyances and inconveniences due to a great rise and fall in the river level, with a consequent swift descending current in the summer months. The building of a railroad would probably cost no more than the

THE LEIHO

initial expense of improving the stream, and its annual maintenance and operation would not exceed the annual maintenance and operation of the river, and, of course, be a vastly more satisfactory means of communication.

The topography of the Siang Valley at the northern end is similar to that of the Yangtze Valley, the hills being low, somewhat broken, and set back from the river. As one follows the Siang up its course the nature of the abutting country gradually changes; the hills become more pronounced in their character and more continuous in their formation, and gradually contract toward the stream. On reaching the Leiho they rise directly from the river itself, leaving but a narrow fringe of arable land along the river or along the small tributaries flowing into it. The Yutan and the other small streams which flow into the Siang take their rise in the Nanling Range, the peaks of which have an elevation along the southern borders of Hunan of from 5,000 to 7,000 feet above sea-level.

The southern half of the province is one vast coal-field, both anthracite and bituminous, although Baron Richtofen stated in his report that no bituminous coal was to be found. His error was due to the fact that the Chinese would not allow him to land, and that he was therefore compelled to judge the field by the appearance that it presented along the river and from such information as he could gather from the natives.

The geological structure of the country is much disturbed, the stratification having a dip of from 30° to 45° in some localities. This disturbance has resulted in so breaking up the coal deposits as to render them soft and friable. In other localities, however, the disturbance has had less serious force, and coals are found of a hard, firm texture, some of the anthracites being sufficiently hard and of such a chemical composition as to permit of their use in blast furnaces.

There are three well-known passes in the Nanling Range, across which trade routes run between Canton and North China. The most easterly is the Meling Pass, between Kuangtung and Kiangsi, with an elevation said to be not over 1,000 feet and across which traffic passes to and fro between Canton and the province of Kiangsi. The westerly one is at the headwaters of the Siang itself and of the Kai Kiang. Here a canal has been constructed, so that it is actually possible to go from the China Sea into the Yangtze Valley by boat. The Kai Kiang flows through the province of Kwangsi into the West

River, making so long a detour to reach this low gap that this route has not been used as much as the Meling on the extreme east, or the most celebrated of the three passes, the Cheling, in the center. The Cheling Pass represents a land portage of 15 miles on either side of the mountains between the navigable waters of the Yutan on the north and the Wei River on the south. Baron Richtofen determined its elevation by barometer observations as about 1,000 feet above sea-level. Mr Morrison, the English engineer, when he crossed the pass in 1878, estimated the elevation by the same approximate method as 1,200 feet. The instrumental survey made under my direction determined the elevation to be 1,190 feet, which probably represents the correct elevation within a very narrow possible margin of error. It is a singular fact, however, that the Chinese failed to find the low point at Cheling. As soon as I began the work of reconnaissance across the range, in order to make out the best route for the survey line to follow, I discovered that the Chinese in building this highway, three or four thousand years ago, had quite failed to grasp the true topographical situation. The true pass across the range lies some three miles to the north of the present highway and at an elevation of something like 110 feet lower.

The rock formation of the range itself is limestone, and, although the valley which marks the pass is sharp and well defined, its presence is almost entirely obscured by the existence of five extraordinary dikes crossing the valley from side to side, and through and under which the streams have been obliged to find their way. A man standing at either end of this valley, which has a length of about four and a half miles, would feel absolutely certain that no valley existed on account of the high walls of limestone, which appear to be a solid barrier. It was only after climbing to some eminence, whence a bird's-eye view of the whole valley can be obtained, that I discovered its existence.

The dikes occur in pairs at the ends, with a single one crossing the valley at about the half-way point. At the north end these peculiar rock walls have a height of about 90 feet, rising to a sharp edge on top and separated by a well-defined basin 1,000 feet across. At the south end the dikes are larger, being about 150 feet high and 1,900 feet apart. The divide of the Yangtze and China Sea waters occurs just south of the northern pair of dikes and is quite clearly defined. During the rainy season it is probable that water will be found flowing in opposite directions at no greater distance than a few hundred

yards, one stream to swell the Yangtze, the other flowing southward and ultimately into the China Sea, 800 miles away.

The presence of this pass will permit a railway line to be constructed between Canton and Central China with an abnormally low ruling gradient. The distance by rail between Hankau and Canton will be about 700 miles. Of this distance 690 miles need have nowhere a gradient exceeding one-half of one per cent, that rate being used crossing the spurs as they jut out to the Siang or the Pei River. The range itself can be crossed by five miles on either side of ascending gradient not exceeding one per cent, including an allowance for the existence of curves.

In Eastern Asia the magnetic variation is small. At Hankau the variation was found to be 45′ E. and at Canton 20′ W. We located the line of no variation just after crossing the Nanling Range.

South from the Nanling Range, at the Meling Pass, flows the Pei River, and south from the Cheling Pass flows the Wei River, the two streams joining at Shaochau, the combined stream taking the name of the Pei River, which it retains to the junction with the West River at Samsui.

Kuangtung has been explored by foreigners, and the larger part of it has been carefully mapped, certainly as high as Shaochau. I am not aware that an actual survey of the Wei River has been previously made, but its correct course is shown on the map which accompanies this paper. The line covered by our survey and shown on the map is one of the oldest and most important trade routes in the country, of which no accurate and definite information was hitherto available. The country is populous and rich, especially in minerals, and will be one of the great factors in the coming material development of China.

NATIONAL GEOGRAPHIC SOCIETY

The active membership ticket for the season 1900-1901 will admit only one person to lectures instead of two as heretofore; but members will have the privilege of purchasing one season ticket, admitting one person, for two dollars, if desired. This change has been decided upon in pursuance of certain recommendations made by President Bell to the Board of Managers last June. The substance of the address is here given, by direction of the Board, for the information of members.

ADDRESS OF THE PRESIDENT TO THE BOARD OF MANAGERS, JUNE 1, 1900

The National Geographic Society should be *in fact* what its name implies—a national organization with national representation. The plan that has been adopted in the past of confining its active membership to residents of the city of Washington, D. C., has made of it practically a local society, although its charter is broad enough to enable it to take in all who are interested in geographic science.

It was the policy of our late President, Hon. Gardiner G. Hubbard, and it has been my policy since taking the reins of office, to enlarge the outside membership so as to place the Society upon a national plane.

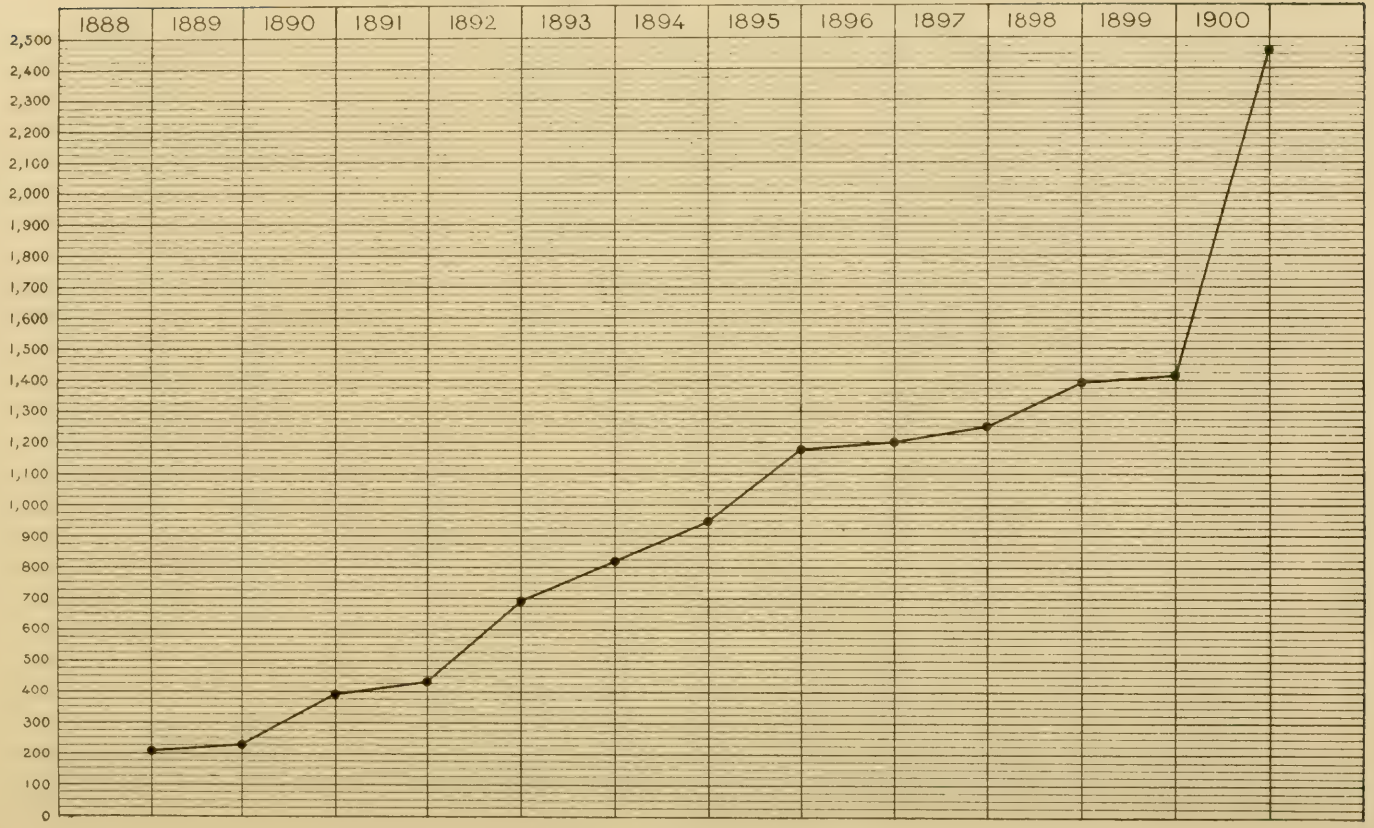
As we only come in touch with outside members through the NATIONAL GEOGRAPHIC MAGAZINE, it seemed to be the part of wisdom to begin our efforts at expansion by devoting special attention to the Magazine. It has always been recognized as one of the best geographic periodicals in existence; but our editorial staff has been composed of busy men, having their primary work in life in other fields of labor, so that the Magazine, although excellent in quality, was sometimes crowded out by other work, and appeared irregularly.

I felt so convinced that the Magazine would prove to be the lever to move the Society into the desired position that last year I recommended, as an experiment, that arrangements should be made whereby one of the editorial staff should be enabled to devote his whole time to the interests of the Magazine and the growth of the Society. The plan was approved; the experiment has been made; the year of trial has passed, and we have now to consider the results.

First, in regard to the Magazine: The editors are to be congratulated on the fact that they are now able to get the Magazine out on time, so that it is now reviewed along with the other monthly periodicals of even date—such journals as the *Review of Reviews* reprinting several of the longer articles. The multitudinous press cuttings received through agencies indicate that the excellence of its contents is recognized very generally by the press of the country, and that newspapers in many different parts of America are quoting from its pages.

The Magazine is undoubtedly exerting a greater and more widespread influence than it has ever done before.

MEMBERSHIP OF THE NATIONAL GEOGRAPHIC SOCIETY
FOR EACH YEAR SINCE ITS INCORPORATION



Now, as regards membership: The graphical chart on the opposite page shows the number of members for each year since 1888:

Starting in 1888 with a total membership of 209, we note a continual and steady increase up to 1899, when we had 1,417 members. Since then the membership has increased to such an extent that it has almost doubled in a single year (1,417 members in 1899, 2,462 members in 1900).

It is obvious, then, that we are moving in the right direction. There is every prospect that attention to the Magazine and to the needs of our outside members will result in an increase of membership so great that we may hope in a few years to have thousands of members where we now have hundreds, and to establish on a lasting foundation a great national society of which we may all be proud.

I would therefore recommend the adoption of the policy of national expansion, and ultimately, when the proper time arrives, of national representation in the Society, with voting power not limited to the residents of Washington, D. C. *Already the Uitlanders outnumber the Boers, 1,264 corresponding to 1,198 active members.**

With this policy in view we may consider various steps that might be taken to bring about the desired result.

NATIONAL EXPANSION

We must pay every attention to our outside members and do everything we can to hold their interest.

(1) At present we can only reach them through our Magazine, and therefore every effort should be made to keep up its character, so that outside members may feel that it is to their advantage to be associated with the Society and receive its publications. It is of the first consequence to success that *the Magazine should appear promptly on time;* that its contents should be up to date, dealing largely with the geography of current events and those topics that are engaging public attention; that the articles should be treated in a non-technical manner, so that all our members may understand them, and that the Magazine should be profusely illustrated with maps and pictures of life and action.

(2) Special privileges might be given to members by affording them the opportunity of purchasing through the Society at reduced rates geographical works, books of travel, histories, etc. A large

* The membership at present (September 15, 1900) is 2,622, of whom 1,413 are corresponding and 1,209 active.

society like ours could easily make arrangements with publishers for the purchase of books upon special terms.

(3) I would also suggest the appointment of a special lecture committee to provide lectures outside the District of Columbia. Our Washington lectures have been of great value and importance and have proved to be very attractive to our members and the public generally. Indeed, it has been difficult to find a hall sufficiently large to accommodate our audiences. It would be entirely practicable to establish similar courses of lectures in some of the larger cities of the United States, and members should have the privilege of purchasing season tickets at less price than the public at large.

It is perfectly certain to me from the experience of the past (see diagram above), that the general membership of the Society will not increase at anything like the rate it has done this year, and that we may even anticipate for next year a falling off rather than an increase, unless special efforts are made to push the membership; and it is equally certain to me, from the great and sudden increase that has followed our experiment in this direction, that continuous and persistent efforts will be rewarded with success; but they must be continuous and persistent. The rise in the curve is too sudden to last, unless special attention is paid to the matter.

RECOMMENDATIONS FOR FUTURE, NOT IMMEDIATE, ACTION

I would also suggest, as a matter not for immediate action, but for discussion and thought, the advisability of amending our by-laws at the next annual meeting of the Society, in May, 1901, so as to abolish the distinction between active and corresponding members. Let all be active members, with a uniform membership fee sufficient to cover the expenses of the Society, with the exception of lecture courses, which should be made to pay for themselves and yield a revenue to the Society to be used for the promotion of geographic research.

The object of this Society is "the increase and diffusion of geographic knowledge." We have done a great deal to diffuse geographic knowledge, but very little to increase it. Our lectures have been so popular as to overshadow the scientific work of the Society. Even our technical courses have been so largely attended as to prevent discussion. *We have been swamped by our own success*, and we have found it increasingly more difficult to hold meetings of a technical character similar to those held by other scientific societies.

I would urge upon the Board the advisability of creating within

the Society a special body of members to be known as Fellows, to be selected from the general membership of the Society for their special knowledge of matters relating to geographic science. These Fellows should form a small body of picked persons and should hold meetings to promote the *advancement* of geographic knowledge.

In spite of our large membership, we are in so poor a condition financially that we have no invested funds to promote the objects of the Society. We live, as it were, from hand to mouth, and have even had difficulty in making both ends meet. This condition of affairs is dangerous and threatens the existence of the Society. In order to give it stability it must have funds, and without a surplus it cannot hope to do much toward promoting geographic research.

I would urge upon the Board the importance of taking immediate steps to create an invested fund for the Society, and I would propose to utilize our lectures for this purpose.

Lecture courses in Washington and other cities could, I am sure, be made to yield a profit to the Society. The proceeds could be turned over to a committee for investment to form a fund for the promotion of geographic research, and the income could be applied as directed by the Fellows of the Society.

These recommendations, of course, are revolutionary in character, and should not be adopted without full time for mature consideration and discussion. I bring them forward now in order that the members of the Board may think them over carefully so as to be prepared to carry them into effect at the Annual Meeting of the Society in May, 1901, if they think best.

RECOMMENDATIONS FOR IMMEDIATE CONSIDERATION

At the present time active members have the privilege of attending all lectures free of charge, and have also the privilege of bringing a friend. Thus it has happened that our audiences have been composed in considerable part of persons who are not members of the Society. Such persons, I think, might very properly be asked to pay. I would therefore suggest that during our next lecture season the membership ticket should admit only one person instead of two.

In order that there should not be too sudden a change in this respect, I would suggest that each member of the Society should have the privilege of purchasing a season ticket, admitting one person, for the sum of three dollars (which represents that proportion of the active membership fee which is intended to cover lectures). In the

case, then, of an active member who desires to bring a friend, he could have the same privileges as now for the sum of eight dollars instead of five.

It is not always easy to make a change involving increased expense to members. In my opinion, however, it is absolutely necessary that some change should be made in this direction at the present time. The superb lectures we provided during the past year were actually given to members and their friends at the *average rate of five cents per lecture.* [The active membership fee was five dollars. Allowing two dollars for the Magazine—the same amount paid by corresponding members—the extra amount of three dollars was charged for the purpose of paying the expenses of lectures. During the past year we gave thirty lectures (see pages 415, 416) for this amount, three dollars, which is at the rate of ten cents per lecture, but as each member's ticket admitted two persons, the actual *per capita* amount received for each lecture was only five cents.]

Surely our members and their friends would gladly contribute a larger amount than this.

In my opinion, we have been in the habit of giving too many lectures. I recommend that, next season, we limit the number to twenty. Then, upon the plan proposed, we should receive from members and their friends the sum of three dollars each for twenty lectures. This means an average *per capita* amount of fifteen cents per lecture. This would give us twice as much for twenty lectures as we have hitherto received for thirty, and at two-thirds the expense for rent of halls, etc.

A HOME FOR THE SOCIETY IN WHICH TO ESTABLISH NATIONAL HEADQUARTERS

If we are to become a great national organization with branches in different parts of the United States, it would be very advisable that we should have a building of our own in Washington as a permanent home for the Society in which to establish the national headquarters. In this connection I am glad to inform the Board that the plans for the proposed Memorial Building to our late President, Hon. Gardiner Greene Hubbard, are gradually taking form and assuming a practicable phase, and it is not unlikely that a Memorial Building may be erected this year and offered for the use of the Society.

It is proposed that the building should contain a few small rooms that could be used as offices, a library and map-room, and a hall or meeting place sufficiently large to seat about 100 people. This

would accommodate the Board of Managers and committees of the Society, and also permit of small scientific meetings of the Fellows of the Society. The Memorial Building, if erected, will place us in a much better position to receive the International Congress of Geographers, which has been invited to assemble here under our auspices.

Everything seems favorable to the establishment of the Society upon a permanent basis, and it only remains for you to take the necessary steps to convert the Society into a really national organization with national representation.

In conclusion, allow me to recapitulate in brief the most important parts of my recommendations:

RECOMMENDATIONS SUMMARIZED

Policy: Let the guiding policy be *National Expansion*, with the object of having in the near future national representation, with voting power not limited to residents of Washington, D. C. (Adopted by the Board.)

RECOMMENDATIONS REQUIRING IMMEDIATE ACTION

1. Arrangements should be made whereby one of the editorial staff should be enabled to devote his whole time to the interests of the Magazine and the growth of the Society. (This has been carried into effect by the Board.)

2. Active membership ticket to admit only one person to lectures; members to have the privilege of purchasing an additional season ticket for lectures for three dollars. (This has been adopted by the Board with the exception that the additional season ticket is to be two dollars instead of three.)

3. Committee on Lectures to be appointed to arrange for lecture-courses in other cities than Washington; season tickets for these outside lectures to be sold to the public, and corresponding members of the Society to have the privilege of purchasing them at reduced rates. (The Board has appointed the following committee to consider and report: Marcus Baker, F. H. Newell, W. B. Powell.)

RECOMMENDATIONS NOT REQUIRING IMMEDIATE ACTION

1. Lower the membership fee for active members and remove the privilege of attending lecture-courses without special charge. Convert corresponding into active members with uniform membership fee for all, whether resident or non-resident, within the District, and do not limit the voting power to residents of the District of Columbia.

2. Lecture tickets to be sold for the benefit of the Society, members to have such privileges of purchase as may be determined upon by the Board; the object of the lectures to be to diffuse geographic knowledge and to raise revenue for the Society to enable it to establish a permanent invested fund for the promotion of geographic research.

3. Create within the Society a special body of members to be known as *Fellows*, to be selected from the general membership of the Society for their special knowledge of matters relating to geographic science, and let the Fellows hold scientific meetings of their own to promote the advancement of geographic knowledge, the income of the research fund to be applied as directed by them.

Respectfully submitted.

ALEXANDER GRAHAM BELL,
President of the National Geographic Society.

THROUGH THE HEART OF AFRICA

In the summer of 1898 two young Englishmen, Messrs E. S. Grogan and A. H. Sharp, left Capetown, bent on reaching Cairo by journeying through the heart of Africa. They said nothing of their project, for as no man had up to that time accomplished the feat there were doubts of their success, and, as Mr Grogan says, "failure is unpardonable." The journey as far as Zambezi was through territory comparatively well known and uneventful. Here their real forward movement began by steamer up the Shire River for 200 miles, then by road 100 more, where a second boat took them 500 miles to the northern end of Lake Nyassa. Then followed a second march on foot, this time of 200 miles, to the south end of Lake Tanganyika, and then by boat again 350 miles to the north end of the lake. The work of exploration began at this point. From here they advanced slowly and with toilsome marches. Mr E. S. Grogan, in *The Geographical Journal* for August, gives an interesting account of their experiences.

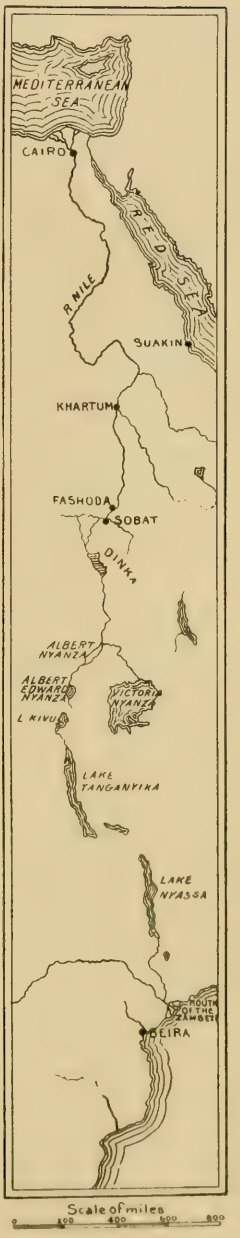
In the neighborhood of Lake Kivu he found evidences of a considerable degree of civilization. The hills were terraced for cultivation, the villages and cultivated lands inclosed by hedges, and artificial reservoirs provided with side troughs for watering cattle. The people here, who "are a purely pastoral folk, breeding a long-horned cattle," were divided into two classes—the Watusi, the aristocrats, probably descendants of the great wave of invasion of Gallas that penetrated in remote ages as far as Lake Tanganyika, who do no work beyond milking and butter-making, and the Wahutu, the aborigines of the country, who are to all purposes mere slaves of the Watusi. "All the cattle belongs to the king absolutely, but was held in trust by his satraps, who again parceled it out among the minor Watusi."

North of Lake Kivu is a region of volcanoes, two of which are still active. From reports from the natives Mr Grogan believes that one of the latter was formed during a terrific eruption only two years before his arrival. The main stream of lava flowed for a distance of 30 miles, engulfing the forest with which the valley was clothed, in many places piling up the lava and ash to a height of 30 feet. "The natives informed me," Mr Grogan states, "that whole herds of elephants were destroyed. I myself saw the bones of one that had been forced up to the top of the edge of the stream."

"In the plain to the north of Kivu, in the pass between the two blocks of volcanoes and on the slopes to the north, owing to the porous nature of the ground, there is no water; yet in spite of this there is an enormous population, the necessary water being obtained by tapping the stems of the banana palms. The moisture is retained by the ground, and consequently the forests that clothe the slopes of the volcanoes are wildly luxuriant and impenetrable to everything but the elephant. When hunting and following close on the tracks of an elephant we had to cut our way with a native axe, without which no one moves a yard. For hundreds of yards at a time one never touched the ground, but was climbing along the prostrate tree trunks and denser growth, which, of course, the elephant would take in its stride. More desperate work or more dangerous hunting it would be impossible to conceive."

In the neighborhood of these same volcanoes a curious type of mankind was observed, tall, with long arms, pendent paunch, and the short legs of the ape.

"When exploring with a small number of followers I observed some ape-like creatures leering at me from behind banana palms, and with considerable difficulty my Ruanda guide induced one of them to come and be inspected; he was a tall man, with long arms, pendent paunch, and short legs of the ape. At first he was terribly alarmed, but soon gained confidence, and when I asked him about elephant and other game he gave me most realistic representations of them and of how they should be attacked. I failed to exactly define their social status, but from the contempt in which they were held by the Waruanda their local caste must be very low. The stamp of the brute was so strong on



them that I should place them lower in the human scale than any other natives I have seen in Africa. Their type is totally distinct from the other people's, and, judging from the twenty to thirty specimens I saw, very consistent. Their face, body, and limbs are covered with wiry hair, and the hands of their long powerful arms, the slight stoop of the trunk, and the hunted, vacant expression of the face made up a *tout ensemble* that was a terrible pictorial proof of Darwinism. The pigmies are of similar build, but have the appearance of full-grown, exceedingly powerful men compressed, and with much more intelligent faces. The pigmies are to these ape-like beings as the dog-faced baboons are to the gorillas.

"Probably they are, like the pigmies, survivals of former inhabitants of the country, the difference in their type depending on the surroundings in which they have had to struggle for existence. The true type of pigmy is a magnificent example of nature's adaptability, being a combination of immense strength necessary for the precarious hunting life they lead and compactness indispensable to rapid movement in dense forest where the pig-runs are the only means of passage. While I was with the main caravan I never saw either a pigmy or one of these creatures, and to study them it is necessary to go unattended; this obviously entails great risk, and it is consequently very difficult to find out much about them. They both have the furtive way of looking at you characteristic of the wild animal, and, though I had one of these curious men with me for a week when I made the circuit of the volcanoes, he would always start if I looked at him, and he followed my every move with his eyes as would a nervous dog; he refused an offer of cloth for his services, and suddenly vanished into the forest without a word, though several times afterward I found him watching me even when I had returned to my camp on the base of Mount Eyres."

Mr Grogan had further experiences with another type of natives later in his journey.

"The Belegga, who inhabit the hills to the north and who were suffering terribly from the effects of the long drought, looked upon me as a great institution, and swarmed down in hundreds for the meat (an elephant killed in the hunt). A weird sight it was. Stark-naked savages, with long, greased plaits of hair hanging down to their shoulders, were perched on every available inch of the carcass, hacking away with their knives and spears, yelling, whooping, wrestling, cursing, and munching, covered with blood and entrails, the new-comers tearing off lumps of meat and swallowing them raw, the earlier arrivals defending great lumps of offal and other delicacies, while others were crawling in and out of the intestines like so many prairie marmots, old men, young men, prehistoric hags, babies, one and all gorging or gorged, smearing themselves with blood, laughing, and fighting. Pools of blood, strips of hide, vast bones, blocks of meat, individuals who had not dined wisely but too well, lay around in bewildering confusion, and in two short hours all was finished. Nothing remained but the great gaunt ribs, like the skeleton of a shipwreck, and a few disconsolate-looking vultures perched thereon."

Vast herds of elephants were met in the swamps of the Dinka region, through which the route lay for several hundred miles. Often "they formed

a serious impediment to our march, as they refused to move out of the way. Nearly every morning we wasted an hour shouting and throwing stones at solitary old tuskers and herds of younger elephants. Banks and banks of hippopotami lay in every direction, but other game was scarce. The mosquitoes were appalling and rapidly killed off two of my boys who had been sick, and the flies by day were even worse."

"The Dinkas have enormous droves of cattle, which they value very highly; they never kill them for food, but from time to time tap the blood, which they drink greedily. They are of colossal stature; some of the herdmen I saw must have been very nearly seven feet, and in every settlement the majority of the men towered above me, while my boys seemed the merest pigmies by their side. They smear themselves with a paste made of wood-ash to protect themselves from the bites of the mosquitoes, and the long lines of warriors threading their way in single file through the marsh appear like so many gray specters. They are absolutely nude, considering any sort of covering effeminate. Their invariable weapons are a long club made of bastard ebony, a fish lance, and a broad-bladed spear, and the chiefs wear enormous ivory bracelets. The southern Dinkas cut their hair like a cock's comb, and the northern Dinkas train their hair like a mop. Both bleach it with manure. Their method of showing respect is spitting on the object of their attention."

Cairo was reached early in 1900. On only two occasions was Mr Grogan compelled to take life, both times in self-defense.

NANSEN'S "FARTHEST NORTH" ECLIPSED

The young Duke of Abruzzi, Prince Luigi Amadeo of Savoy-Aosta, son of that Amadeo who for two turbulent years, 1871–'73, was called the King of Spain, and a nephew of the late King Humbert, has eclipsed Nansen's "Farthest North." Nansen reached latitude 86° 14′, the Duke of Abruzzi 86° 33′, while Lockwood (Greely expedition) gained 83° 24′, which is still the most northern land ever reached by man. The Duke of Abruzzi came within 239.15 statute miles of the Pole, Nansen 261 miles, and the Greely expedition 456.50 miles. The Italian prince is the first of the Latin race to cross the Arctic Circle since the days when another Latin, Gaspar Corte Real of Portugal, in 1500, discovered Hudson Strait and entered it never to return.

The *Stella Polare*, a vessel modeled after the plans of the *Fram*, but smaller and less stockily built, sailed from Christiania June 12, 1899, carrying the Duke of Abruzzi and some twenty officers and crew. It is stated that half a million dollars had been lavished on the equipment (see NAT. GEOG. MAG., vol. x, p. 362). In latitude 82° the ship was forced by the ice in Table Bay on to the land. One side had been crushed in, the hold had filled with water, and all attempts to staunch the leak had been futile. A single tent, constructed from the two which the party had brought with them, was pitched upon the land and a heavy sail laid over it and fastened down with planks taken from the ship. Several stoves were set up inside the tent; but though they were kept

CAPTAIN UMBERTO CAGNI

Leader of the party which reached latitude 86° 33′ north

at red heat during the whole of the first night there were 17 degrees of frost inside, and even the men's boots were frozen. After the first terrible night, however, they succeeded in keeping tolerably warm and comfortable. The tent was quite high, 18 feet, but as winter passed the roof bent more and more under the weight of snow and ice until it sometimes seemed as if it must yield to the strain.

In the early spring the exploring parties commenced work. Four expeditions were sent out. The first started northward to establish depots of supplies at regular intervals for the main party which was to follow. They were successful and returned after an absence of a few days. The second party, consisting of a Norwegian machinist and two Italians, never returned. These three men were the only ones lost during the year. The third expedition was gone 24 days, and the fourth 104 days. It was this fourth expedition which reached latitude 86° 33′.

The Duke of Abruzzi had originally hoped to lead the advance, but the loss of two fingers from the frost compelled him to remain by the ship when the main party started, February 28, 1900. Their first attempt to advance was checked by violent storms, which drove them back to shelter. A few days later, March 11, they again started, the party including Captain Cagni, who is known in America as one of the companions of the Duke of Abruzzi in his ascent of Mt St Elias; M. Cueders, two Alpine climbers, and one other Italian. On their way northward they visited a hut built by Dr Nansen in Franz Josef Land. Cairns were built by them to commemorate the three men who had perished. On gaining latitude 86° 33′, satisfied with having advanced 21 miles further than Nansen, Captain Cagni turned back and reached his ship the third week in June. By patience and hard work the *Stella Polare* had been patched up and rendered seaworthy by the time the ice broke up sufficiently to allow them to escape. It is too soon to learn the scientific results of the year of exploration, but apparently these were quite satisfactory.

A cablegram from London states that Dr Nansen and the Duke of Abruzzi have formed a partnership and will soon undertake a joint expedition to the North Pole.

GEOGRAPHIC NOTES

Dr Matignon, the physician of the French legation at Pekin, has published a book entitled *Superstition, Crime, and Misery in China*, which contains a fund of facts about the lowest strata of Chinese society. He estimates that there are in Pekin one hundred thousand beggars, one-sixth of the population of the city. They are all members of one society, with a perfect organization. Their president, by election, is called the King of Beggars, and has absolute authority over all, even to life and death, nor does the government ever question his power over all beggars. The chief beggar divides the city into sections, which are assigned to different sub-chiefs. Each leader sees that his section is carefully exploited, and at nightfall hands his receipts to the common treasury. The shops are graded, and each must pay a proportionate tax. If the shopkeeper refuses to grant the extortion, the beggar

silently departs, but soon returns with several companions and with increased demands. A fire that night and a total loss of stock and building follow a persistent refusal. To escape the polite, daily persistence of these rogues, shopkeepers often pay yearly tribute to the King, who promises and gives them his protection from such annoyance. Beggars rarely trouble private houses, except at times of funerals or weddings, and then their absence may be purchased. They find a lodging where they may. The bed of many is the middle of the street and their coverlet the dust of the road, which they throw over their bodies before falling to sleep. Winter frosts and pests ravage their ranks. In the summer of 1895, when the cholera raged in Pekin, 50,000 beggars perished. During the winter and spring which followed they seemed to have vanished from the streets, so terrible had been the devastation of death among them.

It now appears that Borchgrevink's South Polar expedition did not reach the South Magnetic Pole in the Antarctic winter of 1899, contrary to the first published reports. The party calculated the position of the magnetic pole, but their attempts to reach it by sled proved unsuccessful. They found the ice quite different from that of Greenland. In Victoria Land enormous glaciers varying in height from 5,000 to 14,000 feet barred advance by sled. Captain Borchgrevink therefore, after several futile efforts to push overland from Cape Adare, sailed on into Ross Bay until latitude 78° 35′ was reached. Here he took to sled again and managed to advance to 78° 50′, the nearest approach to the South Pole yet made. He agrees with the scientists of the Belgian Antarctic expedition of the preceding year, which, it will be remembered, was the first to pass a winter within the Antarctic Circle, that the winter is much harsher in south polar than in north polar regions.

The great tide of German emigration has ceased, judging from the figures of the number of Germans emigrating during the last two years. In 1899, 23,740 Germans sailed from Hamburg, Bremen, and other ports to settle in a foreign land; during the preceding year, there were 1,500 less. Of these, about 19,000 were bound for the United States, 1,976 for Central and South America, and 548 for Africa. It is only a few years since more than 200,000 Germans were leaving Germany each year.

The Rockies of Canada. By Walter Dwight Wilcox. With 44 illustrations, including 25 photogravures and 17 half-tones, and 3 maps. Large 8vo, pp. ix + 309. New York and London: G. P. Putnam's Sons.

Mr Wilcox is a gentleman of means, who devotes his leisure time and much of his income to travel in out-of-the-way places and to exploration. He is a surveyor, something of a naturalist, a pleasing writer, and a most artistic photographer, and therefore he is able to share with others the fruits of his travels. The present work, which is in part a second edition of his "*Camping in the Canadian Rockies*," is composed mainly of a narrative of his explorations in this "Switzerland of America." It closes with chapters on mountaineering, hunting, and fishing, and the Stony Indians. The region he describes is in the highest, most rugged and icy of Canada's portion of the Rocky Mountain system—a region well worthy the attention of Swiss Alpine climbers when seeking for new mountains to conquer.

PROCEEDINGS OF THE NATIONAL GEOGRAPHIC SOCIETY, SESSION 1899–1900

Special Meeting, November 3, 1899.—Vice-President McGee in the chair. Hon. John W. Foster, ex Secretary of State, gave an illustrated lecture on the Alaskan Boundary.

Regular Meeting, November 10, 1899.—Vice-President McGee in the chair. Prof. A. J. Henry, of the U. S. Weather Bureau, gave an illustrated lecture on the Variations of Lake Levels.

Special Meeting, November 17, 1899.—President Bell in the chair. Mr Walter Wellman gave an illustrated lecture on his Arctic Explorations of 1898–1899.

Regular Meeting, November 24, 1899.—Vice-President McGee in the chair. Mr J. B. Hatcher, of the Carnegie Museum, Pittsburg, Pa., gave an illustrated lecture on Explorations in Patagonia.

Special Meeting, December 1, 1899.—Vice-President McGee in the chair. Prof. G. K. Gilbert, of the U. S. Geological Survey, gave an illustrated lecture on the Glaciers of Alaska and the Harriman Alaskan Expedition.

Regular Meeting, December 8, 1899.—Vice-President McGee in the chair. Hon. John Barrett, ex-Minister to Siam, gave an illustrated lecture on the Philippine Islands and Their Environment.

Special Meeting, December 15, 1899.—Vice-President McGee in the chair. Hon. Dean C. Worcester, of the Philippine Commission, gave an illustrated lecture on the Filipinos.

Regular Meeting, December 22, 1899.—Vice-President McGee in the chair. Mr F. H. Newell, Hydrographer of the U. S. Geological Survey, gave an illustrated lecture on Gila River, Arizona, and its Irrigation Possibilities through Water-storage.

Regular Meeting, January 5, 1900.—President Bell in the chair. Col. F. F. Hilder, of the Bureau of American Ethnology, gave an illustrated lecture on British South Africa and the Transvaal.

Special Meeting, January 12, 1900.—Vice-President McGee in the chair. Mr Edwin V. Morgan, Secretary to the Samoan Commission, gave an illustrated lecture on the Samoan Islands.

Regular Meeting, January 19, 1900.—President Bell in the chair. Mr N. H. Darton, of the U. S. Geological Survey, gave an illustrated lecture on the Black Hills of South Dakota.

Special Meeting, January 26, 1900.—President Bell in the chair. Hon. Dean C. Worcester, of the Philippine Commission, gave an illustrated lecture on the More Civilized Filipinos.

Regular Meeting, February 2, 1900.—President Bell in the chair. Dr Frank Russell, of Harvard University, gave an illustrated lecture on Explorations around the Arctic Circle.

Special Meeting, February 9, 1900.—Vice-President McGee in the chair. Mr Wm. Barclay Parsons, C. E., gave an illustrated lecture on Explorations along the Yangtze.

Regular Meeting, February 16, 1900.—Vice-President McGee in the chair. Dr Geo. M. Sternberg, Surgeon-General U. S. Army, gave an illustrated lecture on the History and Geographic distribution of Bubonic Plague.

Special Meeting, February 23, 1900.—President Bell in the chair. Hon. William E. Curtis gave an illustrated lecture on the Road to Bolivia.

Regular Meeting, March 2, 1900.—President Bell in the chair. Prof. John M. Coulter, of Chicago University, gave a lecture on the Geographic Distribution of Seed Plants.

Lenten Course, March 6, 1900.—President Bell in the chair. Prof. J. Howard Gore, of Columbian University, gave an illustrated lecture on the Growth of the Netherlands.

Special Meeting, March 9, 1900.—President Bell in the chair. Rev. T. S. Wynkoop gave an illustrated lecture on Social and Economic Conditions in India.

Lenten Course, March 13, 1900.—Vice-President McGee in the chair. Prof. Jean C. Bracq, of Vassar College, gave a lecture on the Growth of France.

Regular Meeting, March 16, 1900.—Vice-President McGee in the chair. Mr Montagu White, former Consul-General of the Transvaal at London, gave a lecture on South Africa—the Country, People, and Problems.

Lenten Course, March 21, 1900.—Vice-President McGee in the chair. Prof. William Z. Ripley, of the Massachusetts Institute of Technology, gave an illustrated lecture on the Growth of Austria-Hungary.

Special Meeting, March 23, 1900.—Vice-President McGee in the chair. Mr Marcus Baker, Geographer to the Paris Arbitration Committee, gave an illustrated lecture on the Venezuelan Boundary.

Lenten Course, March 27, 1900.—President Bell in the chair. Prof. John L. Ewell, of Howard University, gave an illustrated lecture on the Growth of Germany.

Regular Meeting, March 30, 1900.—President Bell in the chair. Prof. William Morris Davis, of Harvard University, gave an illustrated lecture on the Waste of the Land on its Way to the Sea.

Lenten Course, April 3, 1900.—Vice-President McGee in the chair. Dr Edwin D. Mead, editor of the *New England Magazine*, gave a lecture on the Growth of England.

Special Meeting, April 6, 1900.—Vice-President McGee in the chair. Commander Chapman C. Todd, U. S. Navy, gave an illustrated lecture on a Voyage up the Amazon River to Yquitos, Peru.

Lenten Course, April 10, 1900.—President Bell in the chair. Prof. Edwin A. Grosvenor, of Amherst College, gave an illustrated lecture on the Growth of Russia.

Regular Meeting, April 13, 1900.—President Bell in the chair. Mr Gerard H. Matthes, of the U. S. Geological Survey, gave an illustrated lecture on the Dykes of Holland.

Special Meeting, April 27, 1900.—Vice-President McGee in the chair. Dr H. C. Frankenfield, of the U. S. Weather Bureau, gave an illustrated lecture on the Floods of the Mississippi.

Annual Excursion and Field Meeting, May 27–29, 1900.—An excursion was made by 250 members and friends to Norfolk, Va., by the special steamer *Newport News*, leaving Washington at 5 p. m. Sunday, May 27, and returning early Tuesday morning, May 29. The total eclipse of the sun, on May 28, was observed at Norfolk. Newport News, Yorktown, and Fortress Monroe were also visited.

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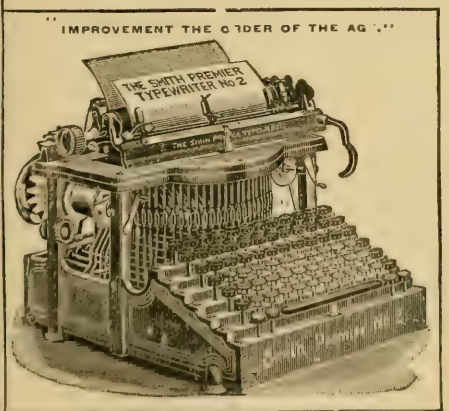

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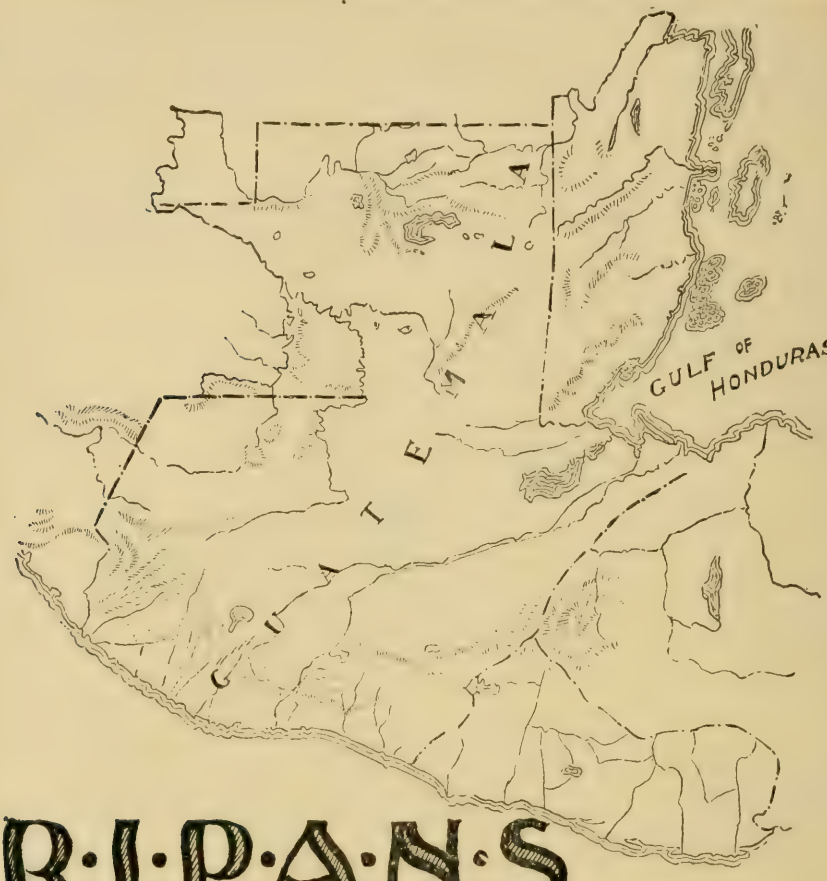

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THE

NATIONAL GEOGRAPHIC MAGAZINE

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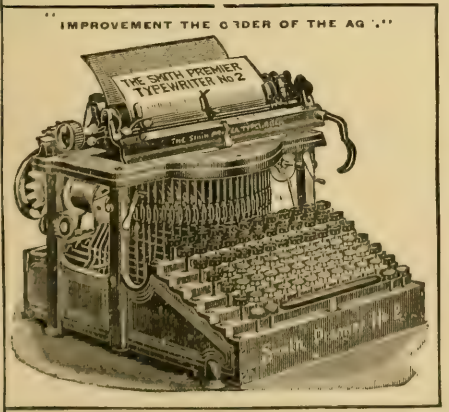

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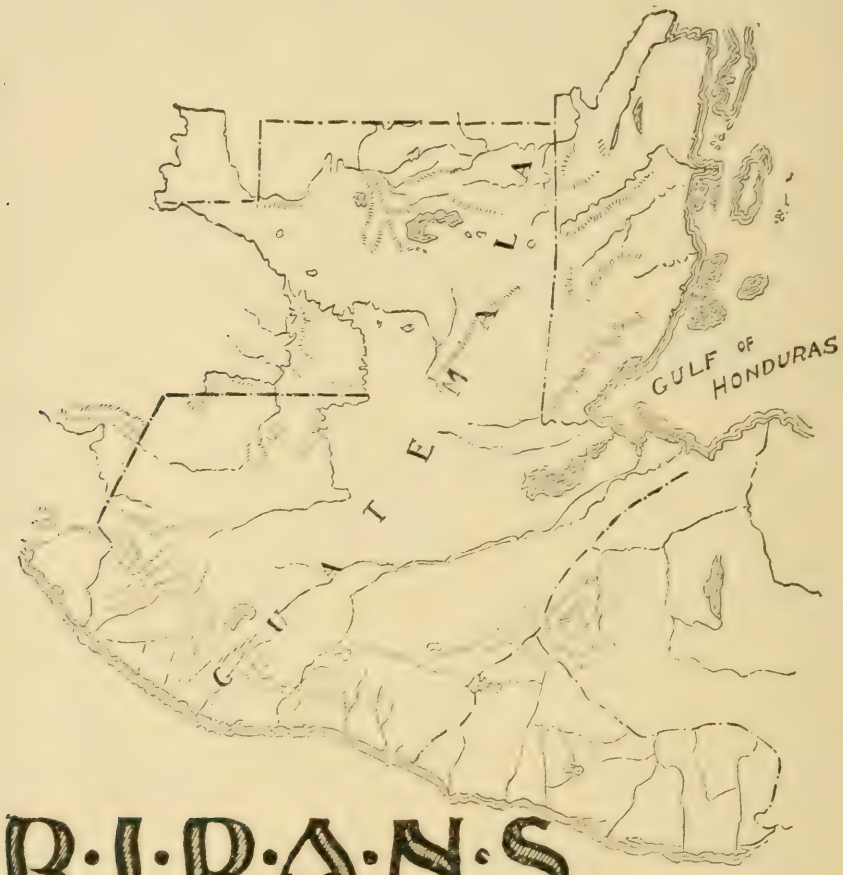

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THE
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VOL. XI NOVEMBER, 1900 No. 11

THE SAMOAN ISLANDS

By EDWIN V. MORGAN,

Secretary to the Samoan Commission

The arrangements for the disposition of the Samoan Islands entered into between the governments of Great Britain, Germany, and the United States may be considered as removing from the international chess-board these small islands which for twenty-five years have been the pawns of the three protecting powers. Whether our European partners are satisfied with their share of the division, their geographical societies and foreign offices alone are in a position to say. The balance sheet of a ledger which states the value of an interchange of territory in Africa and the South Pacific must necessarily wait many years before it can be struck. Whatever the final conclusion may be, the United States has wisely decided that the share that has come to her is the share, and the only share, which she desires, since without assuming fresh responsibilities, either for defense or for government, she has secured an entrepôt and a naval base unique in the Pacific.

Samoa, called by former geographers the Navigators Islands, from the skill in navigation shown by its inhabitants, consists of four principal bits of land lying in the South Pacific between 169° and 173° west longitude and 13° and 15° south latitude, nearly midway between New Zealand and Hawaii. The number of islands in the group may, by counting the smaller, be increased to 11, or even 14, but only Savaii, Upolu, Tutuila, and the three usually included under the general term Manua, with Manono and Apolima, are important. All are verdure-clad and inhabited, and in appearance and shape resemble immense green hats, the interior representing the crown being mountainous, while the brim or shore is covered with cocoanut palms, breadfruit, banana, and other tropical trees, which furnish the native

food. At some prehistoric period the peaks of a submerged mountain chain running northeast and southwest have been lifted from the depths of the ocean by the upheaval of volcanoes now long extinct. Accumulations of soil brought by heavy rains from the mountains meet the ever-growing reef, which prevents easy approach to land except in those places where fresh-water streams, forcing their way through, form openings in the coral barrier. Between reef and shore a lagoon, varying in width from two hundred yards to two or three miles, provides a secure highway for coast and inter-island traffic. The entire length of the group, if Rose Island be included, is little less than 300 miles, and its gross area in round numbers is 832,000 acres, a territory larger than the state of Rhode Island by 50 and smaller than Delaware by 750 square miles.

The attention of the people of the United States was first drawn to the islands in the year 1871, when E. Wakeman prepared a report on them after an examination which he had made at the request of W. H. Webb, then considering the establishment of a line of steamers from San Francisco to Sydney *via* Hawaii and Samoa, over the route since traversed by the Oceanic Company. Apia, on Upolu, was then, as it is today, the only settlement of size. Mr Wakeman foretold, however, with possibly too great optimism, that on Tutuila, on the shores of Pago-Pago Bay, a town would arise which might have a great commercial future. The only protection to Apia harbor is a bar, awash at low tide, which even in calm weather does not prevent a swell from entering that makes vessels strain at their cables and often prevents colliers from coaling a steamer. During the hurricane season, from January to April, the men-of-war in port keep steam up ready to put to sea when a storm threatens, as H. M. S. *Calliope* succeeded in doing in the hurricane of 1889.

At Pago-Pago there is a double harbor, shaped not unlike a fish-hook. The entrance to the outer half is three-fourths of a mile wide, with soundings of 36 fathoms, while the inner, extending inland more than a mile, with a breadth of from 1,100 to 3,000 feet, can furnish ample room and safe anchorage, in spite of its depth, for a score of steamers. Its mouth is protected by a pair of promontories and by an island, and around its sides hills spring abruptly to a height of from 800 to 1,000 feet, Matafas, the peak at the entrance, reaching 2,359 feet. Palms and other tropical trees so cover these hills to their summits that when seen from any high point the ground appears completely hidden by a dense mass of foliage, from

which round, thatched huts peep like huge beehives. On the other side of the island, across the mountains and ten miles away, is Leone, the principal settlement, where the London Missionary Society has a station and where a store or two, kept by white traders, supply the natives with their favorite articles of American manufacture—cotton goods, kerosene, and tinned salmon. Leone was not attacked during the recent outbreak, and still retains a primitive appearance, as do also the villages about Pago-Pago, where Mauga is high chief.

It was with the father of the present bearer of that name that Commander (afterward Admiral) Richard W. Meade, U. S. N., made the compact which brought Tutuila in touch with the United States. On board the *Narragansett*, February 17, 1872, he signed with Mauga an agreement by which this country might acquire, if the Senate approved, "the exclusive privilege of establishing in the said harbor of Pago-Pago a naval station for the use and convenience of the vessels of the United States Government," and obtained a promise that Mauga would not grant a like privilege to any other foreign power or potentate. On March 9 in the same year a convention was arranged between Mauga and three other chiefs of Tutuila, by which they bound themselves to form a league and confederation for their mutual welfare and protection and to unite their several districts under a flag made for them by Meade out of old bunting. It was partly due to the fact that it was not in the interest of any one chief to keep it, and partly because there was no central power of sufficient strength to enforce obedience, that this convention was not faithfully kept. Meade, foreseeing that this would be the case, recommended that the United States should ratify the agreement between Mauga and himself, and for that purpose it was sent by President Grant to the Senate, which body did not ratify it until 1878, when certain objectionable features were eliminated.

It is commonly and incorrectly believed that by this treaty land was acquired. All the rights gained, however, were the concession which gave our vessels the privilege "of entering and using the port of Pago-Pago and establishing there a station for coal and other naval supplies for their naval and commercial marine," the Samoan government at the same time promising neither "to exercise nor authorize any jurisdiction within the port adverse to these rights."

In the following year Germany and England, which had long had interests in the group and were anxious to enjoy privileges equal to

those secured by us, concluded treaties with the Kingdom of Samoa, by which the former obtained the right to establish a naval station in the harbor of Saluafata, in Upolu, which should not be granted to any other nation, and the latter the right to found a naval station and coaling depot on the shores of a Samoan harbor, to be designated by Her Majesty, there being excepted from this right the harbors of Apia and Saluafata and that part of Pago-Pago which might thereafter be "selected by the Government of the United States as a station." The selection was not made until some years later, when the important strategic point of Goat Island, at the entrance of the inner harbor, and a piece of land between 15 and 16 acres in extent was purchased of the native owners for the United States. Upon this land a firm of American contractors is now erecting a coal shed and a steel pier which is to extend 250 feet from shore to the edge of the coral reef. The cost of these improvements is to be a quarter of a million dollars, and it is thought that the contractor will clear but an insignificant sum by his undertaking, since the expense of bringing materials from San Francisco and the high price of labor will absorb the profit he might make were he engaged upon the same work at home.

A story is current that some years ago a shipload of coal, brought from Norfolk at great expense, was dumped on to the beach. In the belief that a sufficient quantity still remained to coal, or at least partially coal, his flagship, an admiral of our navy recently visited Pago-Pago, only to find that the last scuttleful had been carried off by the half-caste widow of a former United States consul, set to guard the pile at the munificent salary of $10 a year.

Commercially, the islands which have come to the United States, either singly or in a group, are unimportant so far as their local production and consumption are concerned, but in their relation to a nation like ours, desiring to cultivate trans-Pacific commerce, they are of the first importance. Mr Goward, an expert who examined them under instructions from the State Department, reported that from a naval point of view Pago-Pago was the key to Samoa, which, in its turn, was the key to Central Polynesia by reason of its geographical position—in the course of vessels from San Francisco to Auckland, from Panama to Sydney, and from Valparaiso to China and Japan—and from being outside the hurricane track.

Throughout the islands the cultivation of cotton was at one time attempted, but the labor was found to be too great, and it has been

practically abandoned. Coffee, it is believed, will yet be cultivated with success. Cocoa thrives, and the plantations are being largely increased. The commercial interests of Germany are generally conceded to be greater than those either of Great Britain or the United States, and for that reason perhaps it is well that Upolu and Savaii should fall to her. These are almost exclusively in the hands of one house, with headquarters at Hamburg, known familiarly at Apia as "the Firm," which succeeded the older South Sea house of Godeffroy & Son, and which exports to Europe and America, in specially chartered ships, the principal product—copra, the dried meat of the cocoanut tree. The copra gathered by the natives, as well as that sold by them to merchants not of German nationality, becomes ultimately the property of this house, a statement sometimes disputed because, as the copra is shipped in British bottoms and frequently billed to British ports, it is somewhat difficult to ascertain with absolute accuracy to the credit of which nation its production and exportation are due.

The inhabitants of the islands are of Polynesian stock and are clearly related to the natives of both Hawaii and New Zealand, but, unlike them, do not seem to be threatened with rapid extermination. Their number is not definitely known, because all data upon the subject have been gathered from approximate estimates and not from official sources. The last general effort to take a census for the group, made a dozen years ago, resulted in fixing the total population at 35,000, and the general belief among the missionaries is that during the present decade it has decreased to 32,000. An epidemic of measles, which caused the death of some thousand persons and which is partly responsible for this decrease, was not prevalent, however, on Tutuila, and that island, with Manua, may at the present time contain, in round numbers, 5,000 natives. The comparative isolation of these two, separated from their western sisters, Upolu and Savaii, by 40 miles of rough ocean, not merely makes it difficult for disease to spread to them, but cuts off their inhabitants from a close connection with the political life of their fellow-Samoans. During the last war none of them was the scene of battle, and had not their warriors been carried in British and American men-of-war to Upolu to assist the Tanu party, it may be doubted whether they would have broken the peace. Manua maintains a government independent of that which directs the affairs of the other islands, and does not take part in the quarrels of rival chiefs or in general in Samoan matters, although on the occasion of the bestowal of the highest title,

"le Tupa" (the grown), upon the chief who is to be recognized as the sovereign of the group, Manua, together with Tutuila, is represented by Lufi-Lufi in Upolu.

The Samoans are preëminently a people of contrasts. They are all nominally Christians and Sabbatarians. In every village is a church, reproducing accurately, both in its architecture and decorations, buildings used for similar purposes in Europe and America. Nearly all adults can read and write, and the missionaries print for them books relating not only to religious but to secular subjects as well. Alcoholic liquors, though easily obtainable, are but little used. On the other hand, both sexes go almost naked—a short loin-cloth being their only garment—and are oiled and painted in a strangely barbaric manner. Though iron is used in weapons, pottery is unknown, cups and bowls being made from cocoanuts. Similarly, in the moral sphere they seem to have many of the gentle virtues. They are courteous and hospitable, and yet a trivial quarrel changes them instantly into barbarians who mutilate their enemies when dead and resort to other savage practices. Extreme laziness is a leading characteristic. They can scarcely be induced to labor on European plantations, and on their own they do only just enough work to supply their immediate needs. They do not trade, there is nothing to hunt or shoot, and although there is plenty of fish in the sea, they rarely eat them, and are with difficulty induced to catch them for foreigners. It is not surprising that people who are at once lively, intelligent, and without occupation—people for whose wants nature has amply provided by giving them a warm climate and a plenitude of vegetable food, gathered without exertion—should quarrel with one another, or that their passion when once exhausted should leave no trace of sullenness behind.

For practical purposes, the natives may be divided into four classes. At the head stand the chiefs, who are hereditary in the sense that they must belong to certain families, but elective in that they exercise authority by virtue of titles conferred on them. The Tulafale, talking-man, is their executive officer, who phrases their thought in eloquent language, and is frequently the central figure in the district and the source of authority. Below him and above the lowest class, composed of what are known as the "common people," are the native teachers and catechists, who wear more clothes and do less fighting than the rest of the population and are under the general charge of the European missionaries.

There is nothing in the dress or bearing of a high chief which enables a foreigner to distinguish him, but he is isolated from the rest of the people by a system of rigid etiquette. No one may hold up an umbrella or do certain kinds of work in his presence, and a special vocabulary is set apart in which to address him. The common names for food, an axe, a pig, etc., are tabooed in his presence. His face, his anger, and other attributes are described in an entirely different set of words from those used for ordinary men. To address him requires a special branch of knowledge, and he who visits a high chief does well to make sure of the competence of his interpreter. Hedged about as he is, the chief, in his intercourse with persons not of his rank, has come to depend largely on his "talking-man," who, like the chief, is elected from certain families in which the office is hereditary. As a rule, no one is elected who has not a gift for oratory, which is a common talent in Samoa. Some talking-men are elected for the large provinces and some for the smaller subdivisions of which each province is made up, but in either case their duties and powers are considerable. They are men of much dignity of carriage, and as they stand leaning upon a staff of office with a "fue," or fly-flap, cast over one shoulder, with which to occasionally emphasize their remarks, they compare favorably in appearance with the orators of a nation more civilized than themselves. In addition to speaking in the name of the chief, it is their duty to distribute food at all public functions where precedence and etiquette are of importance and to perform other official acts. During the late war party feeling was keenly aroused and the cause of Mataafa much strengthened by the desertion of Lauti, the principal Tulafale of Malietoa Laupepa, the father of Tanu, to Mataafa's side.

The various bodies of talking-men grant titles, called Papa, or Ao, to which the Samoans attach great importance, but the title need not be granted by the whole body or by a majority, and may even be bestowed by one qualified person. Inferior titles are often borne without consent by two or more chiefs who have each received them legally from different members of the same body; also the Samoan's mind sees no incongruity in a title being both hereditary and elective—that is to say, if the bearer of a title thinks proper, when dying, to bequeath it to his son, or, as is more common, to his sister's son, his wishes will probably be respected.

There are four or perhaps five great titles which stand out above the others and which may confer upon anyone who holds them the

position of Tupa, or King. Curiously enough, the name Malietoa is not one of them. It means "well done, fighting cock," and was given to a hero who distinguished himself in the Tongan wars. Its importance lies in the fact that it carries with it, *ipso facto*, the third and fourth of the titles just referred to. The claim of the present Malietoa Tanu to be king was that his father Malietoa Laupepa bequeathed to him the title of Malietoa, which gave him two titles. Then some of the talking-men of Aana and Atua conferred on him the other two. Further, Tamasese, who claimed that he had an independent right to these, resigned his rights in favor of Tanu. In like manner Mataafa received two of his titles—Lord of Aana and Lord of Atua—from the talking-men of these provinces, while certain Malietoa talking-men gave him the titles of that name. Thus, according to Samoan custom, both candidates for the kingship may have possessed the necessary qualifications for it, and the matter may have been able to be settled only by fighting it out or by the resignation of one of the candidates. It is clear from Samoan traditions that in early times there was no king, in the sense of the head of a monarchical government. The four or five great titles which stand out above the others were but occasionally united in the same hero, and then only until another arose who took them away. The early missionaries, wishing to provide some fixed government and a single ruler upon whom they might exert influence, developed this idea into a kingship. In historic times no king has held undisputed sway in the islands, and Malietoa Laupepa, of whom our information is fullest, was hardly recognized at all outside the town of Apia and the district of Tuamasanga, from which he came. As has already been observed, office in Samoa can by a strange confusion be both hereditary and elective. The king must have the four or five titles conferred on him, but he must also belong to one of the two families of Tupua and Malietoa. Here, again, is a confusion, for Malietoa is a family name as well as a title. Any man of the family may call himself Malietoa, but Mataafa also claims the right to be so styled, not by birth but by election, and both he and Tamasese are members of the Tupua family.*

The white population, like the native, may be separated into classes—the chief justice of Samoa and the president (or mayor) of the municipality of Apia, the one usually an American and the other a German, with the consuls of the three powers that were party to

* I am indebted to the courtesy of one of the Samoan commissioners for these facts.

the Berlin act and the commanders of such war ships as may happen to be in port—form an upper circle of officials, below which are the missionaries, traders, and beach-combers.

The missionaries represent three very different religious faiths. Those of the London Missionary Society (Congregational) have been longest in the field and claim some 27,000 converts. The Catholics, under the direction of French Mariest priests, number 6,000 or 7,000, and support the German interests. The missionaries from the United States are Mormons from Utah, and though but lately arrived have a fair number of followers. Those whom we met were God-fearing men, living with but one wife, and neither preaching nor practicing the objectionable features of their belief. It is to be regretted, however, that as many as three sects should proselyte in the islands. A simple-minded people like the Samoans are not able to comprehend intricacies of doctrine, and, failing to appreciate theological subtleties, see in the efforts made to convert them to a given faith merely the selfsame principle of jealous rivalry which prompts a merchant to make his wares more attractive and less dear than those of his fellow-merchant across the street.

The beach-comber has been aptly described by Robert Louis Stevenson in "The Ebb-Tide" and other tales of the South Sea. The characters he depicts are strictly true to life. Making good in Yankee "smartness" what he lacks in moral force, he has usually fallen into disgrace in England or the United States, emigrated to the Colonies, broken the law there, and extricated himself by means which have enabled him to escape jail, but have driven him into exile, out of range of extradition laws. He lives as a petty lawyer or trader, on the credulity of the native, whose property he endeavors to secure. War and disorder are provender to his cupboard. One Apia beach-comber confessed—a man more naïve but not less cunning than his mates—"we want a condition of anarchy, for anarchy brings men-of-war. War ships carry sailors and marines, who buy our goods and liquor and spend money freely. Every ship-of-war that lies in port for a month leaves in my shop a thousand dollars. What is the advantage of peace?" It is fellows of this class that incite the natives to revolution, and over whom, rather than over the Samoan, a firm hand is necessary. They have been at the bottom of many of the troubles which have arisen since white men first landed, and the late disastrous war can be traced more directly to their machinations than to any other source.

Over a docile and tractable folk, as most of the Samoans are, it should not be difficult to create a permanent form of government that would be acceptable to them. It should be strong enough to be respected, simple enough to be easily understood, and sufficiently economical not to impose too heavy a burden either upon the natives or upon us, who will be held accountable in the event of failure. The form proposed by the Samoan Commission and explained at length by the American commissioner in his report to the Secretary of State, printed as Senate Document No. 51, embodies these principles. In place of the kingship, the commissioners recommended a system of native government, with an executive officer at the head, whom they designated an Administrator, and to whom as the center of authority they gave real powers of administration. The islands were to be divided into certain administrative districts (corresponding as nearly as possible to those recognized by Samoan usage), for each of which a chief was to be responsible, and these chiefs were to meet annually in a native council to discuss such matters as interested them and make recommendations to the Administrator and his cabinet. Native courts were to be allowed to punish minor crimes according to native law and customs, and every provision was to be made to secure to the Samoan population the complete enjoyment of civil and political rights.

It was only after a tour of ten days through the islands, during which, at a series of meetings in the principal villages of each district, the views of the chiefs on government were ascertained, that the commissioners agreed upon the recommendations just cited. Their aim in formulating them was to leave to the native the largest liberty within the district and to teach him self-government through the local assembly until he should be able to take his part in the government of the islands with an intelligence equal to that of the white man. At the same time they all recognized that tripartite rule was impracticable, and that an arrangement like that since agreed upon between the three protecting powers was the only practicable one. In their joint report they strongly advised it, and no one rejoices more than they that it has gone into effect.

THE MANILA OBSERVATORY

By Rev. Father José Algué, S. J.,

Director of the Manila Observatory

The Manila Observatory began its work as a non-official enterprise in the year 1865, under the direction of the Jesuit fathers, who were employed as teachers in their college in the walled city, generally known as the Ateneo Municipal. Soon they commenced observations on their own account, their principal object being the study of typhoons. The following September one of these typhoons did great damage to the city and harbor of Manila, which caused the Jesuits to become more interested than ever in the discovery of the laws of the typhoons, so frequently destructive of life and property in these regions. The first father who acted as director of the new observatory was the Rev. Father Faura, and the first endeavor of the observatory was, of course, to discover, if possible, some way of forecasting any typhoon dangerous to Manila, and to announce within sufficient time to avoid disaster the track the storm would probably follow.

Father Faura was assisted in his task by two other Jesuits, Fathers Nonell and Ricart, and the college provided them with a few meteorological instruments, absolutely necessary for their researches. With these simple means they began a series of observations which were diligently recorded from September, 1865, until the end of 1869. A paper containing these records was sent monthly to the principal observatories of the world, followed at the end of the year by a summary of the meteorological results of each month and a brief account of the principal atmospheric perturbations noticed during the year. In 1868 the institution acquired the universal meteorograph, which had gained for its inventor, Father Secchi (of Rome), a great fame at the Paris Exposition of 1862. With the aid of some wealthy residents of Manila, several other instruments for direct observations were purchased, all of them corrected and compared with the standard instruments of the French Observatory of Montsoures. As with this new set of instruments observations could be recorded on a larger scale, the *Monthly Review* of the observatory was considerably enlarged and illustrated with the correlative meteorological curves of the principal meteorological phenomena of each month.

Seven years later, when the city of Manila and the Philippine Islands in general were beginning to appreciate the utility of the observatory, a subscription amounting to 7,542 Mexican dollars was raised for the purpose of enlarging the observatory and endowing it with more and better instruments. This token of public favor greatly stimulated the Jesuit fathers, and more particularly Father Faura, to carry out their ambition to make the Manila Observatory, if not the very best, one of the best in the Far East. For this purpose, Father Faura visited the principal observatories of Europe. At Rome he had conferences with the famous Italian astronomer, Father Secchi; in England, at Stonyhurst Observatory, he acquainted himself with the method of maintaining a complete magnetic observatory. From thence he proceeded to Paris, where he collected all possible information regarding meteorology, magnetism, and seismology.

On his return to Manila, Father Faura brought new interest to the work of the observatory. Perceiving that there was some connection between barometric oscillations and the proximity of a typhoon, he investigated the relation, and soon found this to be a fact. Thus to Father Faura belongs the honor of being the first in the Far East to predict the existence and to determine the probable path of these storms. The first typhoon warning was published July 7, 1879, stating that a storm was crossing the northern provinces of Luzon. Later advices confirmed the prediction. The typhoon had really crossed the island, and done great damage in the northern provinces of Isabela and Cagayan. On November 18 of that year the observatory announced the approach of another typhoon, and predicted its course as dangerous to the city of Manila. The forecast caused intense excitement throughout the city, but especially in the naval department. The captain of the port, D. Alejandro Churruca, prohibited communication with ships in the bay and suspended all traffic. The governor-general of the islands came in person to the observatory to ascertain the truth of the prediction. The answer was that a typhoon threatened the city, and that it was imperative to prepare for emergencies. Precautions were then effectively taken in accordance with the instructions of Father Faura. The typhoon came, and, owing exclusively to the warning of Father Faura, the city was prepared, and little damage was done by the storm, but in all the other parts of the island where notice could not be transmitted for lack of telegraphic communication the havoc was terrible. Forty-two shipwrecks, with great loss of life, were recorded.

The forewarning of this typhoon brought such honor to the observatory of Manila that its storm warnings have ever since been carefully heeded throughout the Philippine Archipelago. In the year 1880 telegraphic communication by cable was established between Manila and Hongkong, and this gave an even greater importance to the already very useful typhoon warnings of Manila. In the same year the announcements of various typhoons were sent from Manila to Hongkong, where their importance was fully appreciated and favorably commented upon in the papers of that colony, especially in the *Hongkong Daily Press*. Soon afterward the British government, informed of the great value of these storm warnings, established in Hongkong a government observatory, the principal object of which is to give timely notice whenever any typhoon threatens the colony.

Various typhoons occurred during the succeeding years, and the warnings of the observatory concerning nearly every one of them proved to be correct. A new subscription was started in 1881 to provide the institution with still more and better instruments than it already possessed. From the subscription (910 Mexican dollars) two very fine instruments were obtained, namely, a Beckley anemograph and a standard barometer of Negretti. When the news reached the colony of Hongkong, there also a subscription was taken up and the money so obtained sent to the manager of the Manila newspaper *El Comercio*, and by him given to the observatory, where it was employed in the purchase of other valuable instruments for meteorological observation. Thus it is apparent that the appreciation of the Manila Observatory was as great in Hongkong as it was in Manila. Several articles in the newspapers of that colony, especially those of the *Hongkong Daily Press* dated October 5 and 12, spoke in very high terms of the work accomplished at Manila. The same paper stated that in the course of the year 1881 eight or nine typhoons were announced to Hongkong from Manila, and that every one of the warnings proved correct.

We need not tarry in the description of these storms; a very interesting study of them was made by Father Faura, whose work on this subject has been honorably mentioned by distinguished meteorologists. The same father published soon afterward another pamphlet on the characteristic signs of an approaching typhoon, entitled *Señales Precursoras de Temporal en el Archipielago Filipino*. It is well known throughout the islands, and is one of the most useful and popular papers on typhoons ever published.

The recognition of the observatory as an official department was due to the recommendations of the authorities of Manila and of some of its more influential residents, merchants, and officers of the navy. The value of the observatory during the preceding typhoon season had been so manifest to every one that the local press urged the Spanish government to assist the Jesuit fathers in their humane work. As, at the same time, notice was received that the British government was about to erect an official observatory in Hongkong, the people of Manila became even more anxious to have their own observatory officially recognized by the Spanish government. Their request was warmly seconded by the captain of the port and by the naval commander, D. Felipe Canga Argüelles, and by other distinguished naval officers, who likewise petitioned for the establishment of a series of telegraphic stations along the coast of Luzon, from whence meteorological reports could be rapidly transmitted to Manila.

The request was favorably indorsed by the governor-general of the Philippines and transmitted to the government at Madrid, where it was finally sanctioned, the Queen Regent issuing a decree April 28, 1884, by which the Manila Observatory was officially acknowledged as a government institution, with a regular subvention assigned for its maintenance. As the erection of the minor meteorological stations was sanctioned by the same decree, fourteen telegraphic posts were established in Luzon at points most conveniently situated for meteorological purposes, and were provided with all the necessary meteorological instruments.

Meanwhile some notable events in the history of the observatory were taking place. Father Faura invented his aneroid barometer, an instrument designed to enable any person to detect the approach of a typhoon with but little labor. This aneroid, generally known in the Philippines as the Faura barometer, has become so popular that it is to be found in nearly every steamer and sailing vessel of these waters and in a great many private houses. Another event was the cooperation of the observatory with the observatories of other parts of the world in simultaneous meteorological observations from 1878 to 1888. A further distinguishing tribute was the interest of the Japanese government in the work of the observatory. In February, 1890, the foreign minister of Japan obtained from the governor-general of the Philippines, through the Japanese consul at Manila, permission for the transmission by cable of meteorological observations and all important typhoon warnings.

In March, 1886, the observatory was transferred from the walled city to the handsome block of buildings it now occupies in the suburb of Ermita. This change of location was for the better, as every instrument is now in its proper place, and the surrounding gardens afford plenty of space for outdoor observations. The geographical coördinates of the place are latitude 14° 34′ 41″ north, longitude 120° 58′ 33″ east.

With the removal a new era dawned also on the work of the observatory, for it had gained a much wider field for investigation by the addition of two new departments, namely, the seismical department and the magnetic observatory. These two sections were officially recognized by the Spanish government October 28, 1888. The work accomplished by the two new departments of the observatory covers too wide a field to be considered in this brief account, but any one who desires special knowledge on the subject will find plenty of information in the monthly publications and in the special work on "Magnetism in the Philippines," by Rev. Father Civera, and on "The Earthquakes of the Philippines," by Rev. Father Sadena Maso.

Various scientific expeditions were successfully carried out by the observatory in different parts of the islands with no small amount of labor and even occasional danger. The most interesting of these expeditions were those of Rev. Father Martin Juan and Juan Doyle to Sulu, Palawan Island, and the southern part of Mindanao; the journey of Rev. Father Ricardo Civera to northern Mindanao and Bisayas, and the voyage of Rev. Father Miguel Saderra Mata, then director of the observatory, to China and Japan. The result of these expeditions is the magnetic chart of the Far East published in January of 1892.

The director of the Manila Observatory, Father Miguel Saderra Mata, was officially invited to the Meteorological Congress of the Chicago Exposition. This invitation was accepted, and two Jesuit fathers, Father Frederic Faura and the writer, were commissioned to assist at the exposition as official representatives of the Spanish government. Father Algué had already been two years in the United States, and in his travels through America and Cuba had had many opportunities of becoming acquainted with the distinguished meteorologists of the New World. The results of this scientific mission can be read in the memoir, *La Meteorologia en la Exposicion Colombina de Chicago*, published by the two fathers soon after their return to Spain. Another official invitation was sent to the director of the

observatory at Manila in 1895 by Mr Robert H. Scott, secretary of the International Meteorological Society, asking the Manila Observatory to coöperate in the international work of cloud measurements, which was to begin May 1, 1896. The director answered favorably, and thus far the Manila Observatory is the only observatory in the Far East which has coöperated with the sixteen observatories of other parts of the world in the international enterprise of cloud-measuring. The details of this work can be found in the publication of the observatory, *Las Nubes en el Archipielago Filipino.*

The equipment of the meteorological department of the observatory is very complete, including instruments for direct observation and self-recording instruments.

Among recent publications of the observatory is a very valuable treatise on the typhoons of the Philippines by the director, entitled *Baguios o Cyclones Filipinos* (1897). It has been honorably mentioned by foreign journals and is now being translated into various languages. Another good work of the director of the observatory is the invention of the instrument called the barociclonometro. It is a combination of an aneroid barometer similar to that of Father Faura, but can be adapted to any latitude, and of a cyclonometer. It is easily handled, and with little labor will indicate to the observer the existence, bearing, and distance of the center of a typhoon.

The installation of the astronomical department was completed in 1894, when the section was transferred to a special building, a solid construction erected in the grounds of the observatory at a cost of nearly $40,000. Here is the great revolving dome, nearly ten meters in diameter, containing the big equatorial telescope, which has a focal distance of seven meters, while the diameter of the objective lens is 49 centimeters. The telescope has a large and costly outfit of additional astronomical instruments, the most conspicuous of which are two large spectroscopes, one of the Töpfer type, made in Berlin, and the other made in London by Hilger. The latter has a grating three inches long, and is one of the largest in the world. The Töpfer spectroscope is of the same size as the one made for the German government at Potsdam. There are three other stone piers in this department, which are to be occupied, respectively, by a comet-seeker, a small photographic equatorial, and an equally small meridian circle. There has also been in regular use since December, 1895, a reflecting zenith photographic telescope for the study of the variation of latitude, a novel instrument, of elegant construction, invented

by the present director. (See "The Reflecting Zenith Telescope." Stormont & Jackson, printers, Washington, D. C., 1893.) For the measurement of photographic plates the observatory possesses two

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first-class micrometers, one made by Saegmuller, of Washington, and the other by the optician Hilger. The micrometric screw of the latter is seven inches long, and is one of the largest yet constructed.

With these micrometers one ten-thousandth of the millimeter can be read.*

Since the year 1888 the astronomical section has had a twofold duty: first, it has given every day the exact hour of noon in Manila civil time, and, second, it has regulated nearly all the chronometers of steamers and sailing vessels entering Manila Bay. So acceptable has been this work of the observatory that more than a hundred chronometers have been brought in each year since January 1, 1894. The astronomical department has also constantly informed the public of Manila of all phenomena worthy of notice, such as solar and lunar eclipses visible in the locality, the appearance of comets, transits of Mercury, and meteoric showers. The building and entire equipment were provided at the exclusive expense of the Jesuit fathers. The astronomical department was to have been officially recognized by the Spanish government for the financial year 1898, but unfortunately war embarrassed all the scientific projects so much cherished by the fathers of the observatory.

The study of earthquakes and seismic phenomena dates almost from the beginning of the observatory, when the first instruments used for this study were pendulums of very simple construction, for tracing the horizontal and vertical movements of the ground. Other instruments were afterward acquired for direct observation and for recording purposes. Soon after the great earthquake of 1880, which nearly laid the city of Manila in ruins, the Rev. Father Faura, director of the observatory, published a very interesting work about the earthquakes. Hourly microscopic observations were commenced in January of 1881, and in 1887 the *Monthly Review* began to be illustrated with the records of earthquakes that occur so frequently in some part or other of the archipelago. The seismic instruments now actually employed are all firmly fixed to the base of a massive pier that runs through the right tower of the main building.

A fair idea of these instruments may be had in the work *La Seismologia en Filipinas* (pages 4–16). This publication of the observatory is a very important one, and contains a detailed catalogue of the long series of earthquakes that have been felt in the Philippines from 1599 to 1890, with the dates of their occurrence and a statement of their severity. Father Joseph Coronas has recently published an ac-

* See the pamphlet: Der Photo chronograph in seiner Anwendung zu Polhöhenbestimmungen, Von Dr Otto Knopf in Jena (Sonderabdruck aus der Zeitschrift fur Instrumenten-kunde 1894, Heft 3), (Verlag von Julius Springer in Berlin).

count of the great eruption of the famous volcano Mayon, which on June 25 and 26, 1897, burst forth with tremendous activity, reducing to ashes innumerable dwellings and killing hundreds of people in the surrounding districts. The same father has prepared, but not yet published, an account of the Philippine earthquakes of 1897, and more particularly of the Zamboanga earthquake of September 21 of the same year.

There are not many first-class magnetic observatories in the world, but it may be asserted that the magnetic department of the Manila Observatory is one of them. It is situated in a splendid position, has the finest of instruments, and its scientific results have been highly satisfactory. The department is located in a separate building, inclosed in the grounds adjacent to the normal school and not far from the meteorological and astronomical departments. It is sufficiently distant, however, from other buildings to be free from the influence of any substance capable of disturbing the magnets.

Meteorological reports are received daily from stations along the China coast, from Japan, and also from the minor stations of Luzon, except in time of disturbance. After a careful examination of these reports, the probable state of the weather for the following twenty-four hours is predicted, and then the ordinary weather note finally redacted. This forecast is then telegraphed to the chief officer of the port of Manila and to the United States admiral at Cavite. The daily maximum and minimum temperatures are given out each day to the newspapers of the city. Twice every day, moreover, at 10 a. m. and 4 p. m., the observatory sends to the chief officer of the port the atmospheric pressure, temperature, direction and force of the wind, and probable state of the weather. At the same hours the observatory transmits every day by cable the same observations to the more important stations of Japan and the China coast.

Whenever there are signs of any change in the weather the work and vigilance of the observatory are greatly increased, as is also its responsibility. When the first signs of a typhoon are detected observations are repeated more frequently, especially of the different forms and directions of clouds; more frequent, and even hourly, reports are demanded from those of the secondary meteorological stations of the island of Luzon, where the weather assumes a more threatening appearance; information concerning the whereabouts and progress of the storm is given out freely to the public of Manila, to the chief officer of the port, and any one who desires it, especially those concerned in

the safety of ships and steamers. As soon as it becomes possible for the observatory to locate exactly the bearing of the center of the typhoon and the course it will probably follow, this is notified to the chief officer of the port, with a view to the hoisting of the convenient

FATHER ALGUÉ IN HIS LIBRARY.

storm signal. If the typhoon is not imminently dangerous to Manila, the observatory, nevertheless, follows its course and transmits all interesting information regarding it to the public and to the chief officer of the port. The observatory takes a special interest also in trans-

mitting by wire, if possible, the forewarning of the typhoon to any province or provinces of the archipelago seriously threatened by the storm, in order to prepare them for emergencies. If the progress of the typhoon becomes dangerous to Manila, then, not only during the daytime but all through the night, if necessary, storm warnings, with all important information, are transmitted to the public and to the authorities more frequently, and if thought convenient special accounts of the typhoon are sent to the chief officer of the port. In short, every possible precaution is adopted by the observatory in order to avoid any kind of disaster. The observatory takes an especial care besides to warn all ship owners and shipmasters to beware of the danger threatening ships on the high seas, and advice is given accordingly to retain their vessels in the bay until the weather abates; in case of sailing, the masters of the ships are cautioned regarding the storm and the way of escaping danger.

But the warnings of the Manila Observatory have always, up to the present, had a much wider circulation than in the islands of the Philippine Archipelago. In truth, many times cablegrams have been sent to us, not only from Singapore and Hongkong, but from other outside ports, desiring information about the weather or about the probable track a typhoon would follow, and if we thought it safe for a ship to make the trip to Manila. To these telegrams the observatory has always been very careful to answer with promptness and precision. But we think it useless here to go on reiterating the importance of the storm-warning cablegrams sent from Manila to Hongkong, Macao, Saigon, Shanghai, and Tokio. The geographical position of the Manila Observatory gives it the great advantage over all other observatories in the Far East of being able first to detect the signs of approaching storms and transmit them to the coast of continental Asia and to the Japanese Empire. Experience shows that it takes two or three days, and even more, for the center of a typhoon to cross the China Sea to the Asiatic seaboard, and if the track of the storm curves round to the northeast, from three to ten days, and sometimes more, elapse before the center of the typhoon reaches Japan. It is evident, therefore, that the storm warnings of the Manila Observatory are of the utmost advantage to the whole Asiatic and Japanese coast line from Singapore up to Yokohama. This is the reason why the local governments of Hongkong, Saigon, Macao, Shanghai, and the government of Japan are so much interested in the transmission by cable of the typhoon warnings of the Manila Observatory.

In general, the average number of these storm warnings sent abroad is three for each typhoon. The first is given when the first signs of the storm are detected, the second when the center of the typhoon is crossing the islands or is at the least distance from them (and this time not only the existence of the typhoon is stated, but also the direction of the storm, if possible), the third and final warning when the center of the typhoon passes out of the archipelago and enters the China Sea or recurves into the Pacific Ocean. The number of these telegrams sent to China and Japan during the years 1894–1897 was as follows: In 1894, 21; 1895, 27; 1896, 34, and 1897, 15, making a total of 97.

These telegraphic warnings have been much appreciated in the colony of Hongkong, as recent events have proved. A distinguished officer of the British navy, after the cutting of the cable between Hongkong and Manila, entreated Admiral Dewey to restore communication, as otherwise great danger would ensue to life and property from the interruption of the telegraphic storm warnings. The United States consul at Honkong also testified to their great value, and requested that the telegrams sent there should also be wired directly to him in the same manner as they were transmitted, before the blockade of Manila, to the Spanish consul in that colony.

It only remains to mention one other public service performed by the Manila Observatory, namely, the gratuitous correction and standardizing of the barometers of ships visiting the port.

THE LIMITED WATER SUPPLY OF THE ARID REGION

By Frederick H. Newell,

Chief Hydrographer, U. S. Geological Survey

A few years ago the old ideas as to the utter worthlessness for agricultural purposes of the land west of the 100th meridian gave way to the most extravagant notions concerning its possibilities under irrigation. It was commonly talked that every acre could be reclaimed, and a man who ventured to assert that the water supply would suffice for the reclamation of only a small part of the land was almost in danger of being mobbed.

Now, however, there is no longer talk of irrigating every acre, even of the most fertile soil, and the statement that only 5 or 10 per cent

of the land can be reclaimed excites comparatively little interest. Public sentiment is now concentrated on the question as to how the relatively small quantity of water can be conserved for the largest use.

That the available water supply is relatively small need excite no surprise. The mountain catchment area is small, the great mountain masses, though impressive, covering but a small part of the arid land. An erroneous idea is largely prevalent that mountains abound on every hand, and that the rain and snowfall upon these must necessarily be large. We hear of the large number of mountains rising to heights of 13,000 or even 14,000 feet throughout the West, but the fact must not be lost sight of that these mountains rise from a base which, as a whole, is at a considerable elevation above tide. Mount Washington, in New Hampshire, is not quite 6,300 feet high, while Pikes Peak, Colorado, is over 14,000 feet; but the former rises from a country whose general elevation is but little above sea-level, while in the case of the latter the surrounding area, as a whole, stands at a height of from 5,000 to 6,000 feet. The State having the greatest range in altitude (California) has only about 1,760 square miles at an elevation of over 10,000 feet, out of a total of about 160,000 square miles; in other words, the high, sharp peaks which dominate the landscape and form the catchment areas for the streams are of relatively small extent when compared with the great open valleys where water is needed.

From all the peaks, however, little streams issue, carrying water throughout the year. In May and June these streams gradually swell to torrents, as they are fed by the melting snow. Descending the steep slopes, they pass from the foothills out among the plains, and their waters rapidly shrink and even disappear. Thus it is that following down a stream of considerable size in the mountains one soon reaches the point where it has attained its greatest volume, and beyond this one passes successively through open valleys where the volume of water is noticeably less, and finally may reach a point out on the plains where the bed is occupied merely by pools fed by occasional storms or by slow percolation from underground. Under the brilliant sunlight the hot winds have drunk up the cooling waters from the heights.

These little streams have from prehistoric times been used in agriculture. We find throughout a great part of the arid West the ruins of ancient towns, and even of irrigation canals of considerable size,

built by a forgotten people. The more intelligent of the early explorers who visited these regions and saw the ruins were impressed with the idea that white men might make homes where these earlier peoples had succeeded. It was not, however, until the systematic surveys of Major J. W. Powell were undertaken that the importance of the subject was fully realized. His first elaborate report on the subject, entitled "Lands of the Arid Region," was printed in 1878, and the public then began to realize the possibilities latent within the arid region. This report, printed in several editions, has formed the basis of many popular articles and discussions, and its recommendations, at first treated with neglect and even with scorn, have been of late most highly commended for their breadth and foresight. Unfortunately, the time has passed to carry out the comprehensive plans outlined toward the reclamation of the West, and conditions have arisen which render it impracticable to undertake many of the most desirable and important projects.

Ten years after the publication of this report Congress finally granted authority for the systematic examination of the arid lands. Field work was begun in the fall and winter, being directed toward the mapping of the catchment basins and the detailed surveys of reservoir sites and of canal lines. The appropriation was not passed until October 2, 1888, and it consequently became necessary to push the work energetically in order to show results before the end of the fiscal year. Thus it was that the surveyors were often impeded by snow, and the work which in summer would have been a pleasure became a hardship.

When the work was discussed it was commonly believed that localities suitable for the storage of water could be found almost anywhere in the mountains. This is still a common belief among people who have not given particular attention to the subject. Almost everywhere in the West the inhabitants point out this locality or that where they consider that a reservoir should be built. Careful examination, however, and a survey with instruments of precision often show that the slopes are too great and the capacity too small for a dam to be built to even moderate height. To hold any considerable volume of water, structures of enormous size must usually be erected, and foundations extending far below the surface of the ground must be constructed.

The number of places where conditions are favorable is limited. Sometimes a reservoir site may be found of good capacity and where

a dam of reasonable size and cost can be built; but here, unfortunately, the catchment area tributary to the site is small, and in ordinary seasons the reservoir can not be filled. In such a case as this it may be practicable to bring water by ditches, tunnels, and flumes from some other catchment area, adding to the natural volume.

Occasionally there are found among the mountains small lakes, mainly of glacial origin, whose outlet can be closed at moderate cost, and a considerable quantity of water otherwise escaping during the spring can be held for use later in the year. Such opportunities are, unfortunately, more often found on the headwaters of streams already furnishing an abundant supply than on those whose volume is deficient.

The surveys of reservoir sites inaugurated during 1888 were pushed with considerable vigor during 1889 and 1890, resulting in the examination of several hundred, mainly in the States of California, Nevada, Utah, Colorado, and Wyoming. Without going into the details of these surveys, it may be said that the results were, as a whole, disappointing, particularly to professional promoters, who had in contemplation schemes involving gigantic enterprises, whose stocks and bonds might be manipulated. These men seemed to feel a personal animosity toward the organization conducting the surveys, because glowing accounts of wonderful wealth were not supplied to stimulate the waning interest in Western development.

It was found, too, that the construction of these reservoirs not only involved large expenditures, but that the conditions of ownership were such that they could not be considered paying propositions. There was no question as to the benefits that would result to the country at large from their construction, but there seemed to be little opportunity for private profit. Of the reservoirs surveyed, few have actually been constructed. Coöperative enterprise has in a few cases brought them to completion, and in other instances corporations owning large canals have been compelled by circumstances to build storage works. The great reservoirs, for the most part located in California, have been built by corporations, mainly through some extraordinary combination of circumstances or through a misapprehension of the actual conditions.

The investigations that have been made were carried on for the purpose of ascertaining the extent to which the arid lands could be redeemed by irrigation. The object was to bring out the broad facts concerning the probabilities of the ultimate development of the arid

region. There were, of course, many localities where it was self-evident that water could be held to advantage, as, for example, in Southern California, where the climatic conditions were such that the semi-tropic fruits flourished to perfection. The valleys of this part of the State, relatively small in size, are protected on the north by mountains which rise abruptly from sea-level, and from these small streams flow in torrential channels. The rapid development of population in these small valleys, due to the salubrity of the climate and the great profits derived from the cultivation of fruits and nuts, early resulted in all the available water supply being utilized, and in compelling the consideration of methods of storing some of the flood-waters. The utilization of these storage sites was further promoted by the fact that most of the desirable land in this part of the country was covered by the early Spanish land grants, the title to which had been confirmed by the United States. Thus these great tracts were not a portion of the public land and did not depend upon favorable legislation for the inauguration of private enterprise. From these and other reasons it has happened that the actual construction of storage reservoirs in Southern California has been far ahead of similar work within what is more strictly the arid region.

HURRICANES ON THE COAST OF TEXAS

By General A. W. Greely, U. S. Army

The graphic and timely article of Professor W J McGee on the terrible calamity that befell the city of Galveston, Texas, has been perused with great interest. Certainly every thoughtful reader must be impressed with his remarks on dangers incident to the building of cities on coastal formations, such as form the shore-lines of the great State of Texas.

It is not my desire nor intention to enlarge upon the geological formations of the coasts of the Gulf of Mexico, nor to discourage the afflicted citizens of Galveston from their energetic efforts to restore their heretofore prosperous city to its former position, as the greatest commercial entrepôt of Texas. Indeed, it is my firm conviction that the ingenuity of man is such that he will be able to adopt such engineering devices as will protect Galveston from a repetition of the

enormous loss of life and property which was caused by the advance of the last West India hurricane.

It is simply my wish to reënforce Professor McGee's cautions by alluding to another chapter in the hurricane history of the Texas coast, concerning which his article is strangely silent, but with which I chance to be somewhat familiar. Reference is made to the hurricane of September 15–16, 1875, which caused a relatively greater loss of life and property to the town of Indianola, Texas, than was inflicted on Galveston by the recent hurricane. A quarter of a century has dimmed the recollection of the Indianola tragedy, and many of the few adult survivors of that ill-fated town have passed over to the silent majority.

Indianola, when I first knew it in 1873, was a town of about 1,500 inhabitants, but it was then waning in population, so that at the time of the storm it had a population variously estimated from 800 to 1,000. In the cyclone of September, 1875, at Indianola, the loss of life, as officially reported by the Signal Corps observer-sergeant, was 176—nearly one-fifth of the entire population—and the destruction of property as exceeding one million of dollars in value.

It should be remembered that Indianola is on the west shore of Matagorda Bay, 14 miles from the Gulf of Mexico, a sheltered position as compared with that of Galveston. I visited Indianola about six months after the hurricane, when the town was partly restored; but at that time there remained evidences of one of the greatest storms of the century. The striking physical changes were the formation of a large lake in the rear of the town and the plowing of numerous bayous inland, five connecting across the solid land of an elevation ranging between 10 and 20 feet above the level of Matagorda Bay, on which the town was built. One of these bayous was nearly 20 feet deep at the time of my visit.

As at Galveston, enormous quantities of sea water were driven inland and the greatest damage and loss of life occurred during the ebbing of the flood seaward. On the coast, at the entrance to Matagorda Bay, both the east and west shoal lights were carried away. The extent and violence of the storm inland may be judged by the fact that at this time the schooner *Agnes* and the *Phœnix* were wrecked two miles inland from Indianola, while the schooner *Comet* was carried five miles inland. So sudden and rapid were the flood waters inland that about 15,000 head of cattle and sheep were drowned.

The hurricane began by a northeasterly gale, which set in on the

15th. The wind increased steadily in force, with a falling barometer, until 5 p. m. of the 16th, when it stood at 28.90. The northeast wind of 82 miles per hour rose to a velocity of 88 miles at 5.15 p. m., but later, as it steadily increased, its velocity at midnight must have reached 100 miles.

But the loss of property least engrossed the attention of Indianola, when the lives of all were for hours in the balance. Realizing the situation, the strongest and best bent their energies to the task before them. During the forenoon of the 16th several hundred lives were preserved by the removal of the inmates of damaged and weak houses to the strongest and most protected buildings. Many people, women and children especially, were thus safely transferred by life-boats. Had it not been for these timely and well-directed efforts during the day, it is believed that more than one-half of the population would have perished.

The following extracts from the official report of Sergeant C. A. Smith, Signal Corps, show the character of the storm later:

"The rain and wind both increased up to midnight, when the velocity must have been fully 100 miles per hour. This would have blown in the doors and windows, coming in gusts as it did, but for the precaution which had been taken of securely boarding them up. Soon after midnight a change in the tide was noticed; it rose several inches for a few minutes, and then began setting seaward rapidly. This evidence of abatement was hailed with shouts of joy, and was confirmed in a few minutes by the action of the wind, which gradually backed to the north and northwest.

"The tide now swept out toward the bay with terrific force, the wind having but slightly abated, and it was at this time that the greatest destruction to life and property occurred. The buildings remaining had been so loosened and racked by northeast wind and tide that the moment the tremendous force was changed in a cross-direction dozens of them toppled in ruins and were swept into the bay.

"It is a noteworthy fact that the immense volume of water, which for 18 hours poured over the beach at Matagorda Bay until for 20 miles the back country of prairie was an open sea, occupied but the short space of six hours to completely recede on the wind changing to the northwest.

"The morning of the 17th opened cool and cloudy, with a gale still blowing from the northwest. We emerged from our retreat at

an early hour, and it was not until then we could appreciate the full extent of the calamity which had befallen the town.

"Fully three-fourths of all the buildings had entirely disappeared from the scene, and of those remaining, a large part were in utter ruins. Many of those remaining had been swept from their original foundation—some but a few yards, others several blocks.

"Numerous bayous indented the shore, occupying the places where prominent buildings stood 24 hours previous. Five of these bayous extended clear across the town, and now join the lake in rear of the town. Seven others of considerable proportion had extended their encroachments but partially across."

Leaving Indianola much impressed by the immense damage wrought, and a few days later passing through Galveston, I broached to Mr E. O. C. MacInerney, for years city clerk, the probability of Galveston suffering similarly in later years. Mr MacInerney had served for years as an observer-sergeant of the Signal Corps at Galveston, and was alive to the observations I then made. He informed me that steps were being taken to strengthen the ocean beach so as to render it less liable to the action of the sea. Whether such corrective measures were continued or not I do not know, but it is evident both Galveston's late experience and the fate of Indianola, which was practically destroyed, emphasize the gravity of the situation. The best engineering talent of the country should apply itself to the prompt solution of the problem of protecting the tens of thousands of valuable lives and tens of millions of property from the assaults of the sea, whose wildest hurricanes threaten the stability of the western Gulf coast.

AFRICA THE LARGEST GAME PRESERVE IN THE WORLD

The fact that the wild animals of the world are in danger of extermination is being forcibly driven home to the minds of all who are interested in natural history. This condition is the result of the ruthless persistence with which game of every kind is hunted, and it may be laid at the door mainly of the rapacious gatherers of hides and ivory. These, however, are assisted to a marked degree by sportsmen and hunters, who for mere sport kill great numbers of valuable animals and wantonly slaughter the fish and birds.

Notwithstanding this, Africa is still rich in animals, birds, and fishes, and by placing certain restrictions upon their destruction many species that would otherwise be exterminated may be fostered and perpetuated. Both the professional hunter and the sportsman would then be able to gun or fish with reasonable success without endangering the future supply of game.

In London, on May 19 of the present year, a convention was signed by the diplomatic representatives of Great Britain, Germany, Spain, Belgium, France, Italy, and Portugal for the protection of the wild animals, birds, and fishes of Africa, which convention, after being ratified by the powers, is to remain in force for fifteen years. By thus acting in concert, the European nations who are most interested in Africa, through their extensive colonial possessions, have formed themselves into a powerful game-protective association, with jurisdiction over the most extensive game preserve in the world.

The area over which the provisions of the convention are to apply includes all that portion of the Dark Continent extending from the twentieth parallel of north latitude to the southern line of the German possessions in southwestern Africa, and from the Atlantic Ocean to the Indian Ocean and the Red Sea. Under the terms of the convention, the hunting and destruction of vultures, secretary birds, owls, giraffes, gorillas, chimpanzees, mountain zebras, wild asses, white-tailed gnus, elands, and the little Liberian hippopotamus is prohibited. The young of certain animals, including the elephant, rhinoceros, hippopotamus, zebra, antelope, gazelle, ibex, and chevrotain, are protected, and also the same species when accompanied by their young. Particular emphasis is laid on the protection of young elephants, and all elephants' tusks weighing less than twenty pounds are to be confiscated by the government if the animal was killed after the convention went into effect. The eggs of the ostrich, among those of a large number of other birds, are to be protected, but those of the crocodile and of poisonous snakes and pythons are to be destroyed. A limited number of lions, leopards, hyenas, otters, baboons and other harmful monkeys, large birds of prey, crocodiles, poisonous snakes, and pythons may be killed.

The method of taking or killing game is regulated to the extent that the use of nets and pitfalls is forbidden, and dynamite and other explosives must not be used for taking fish. Only persons holding licenses issued by the local governments are allowed to hunt wild

Map of Africa, showing territory within which the Convention of May 19, 1900, places restrictions on the killing of wild animals.

animals within the protective zone, and these are revocable where the provisions of the convention are in any way violated.

Another provision of the convention is that the contracting parties shall, as far as possible in their respective territories, encourage the domestication of zebras, elephants, and ostriches.

JOHN B. TORBERT.

ANNOUNCEMENTS

The Board of Managers of the National Geographic Society begs to announce to the resident members that about 200 responses to circular letter of October 18, 1900, have been received. A very large majority of the replies favor a reduction of the number of lectures by dropping either or both the Lenten and Technical courses.

With this positive expression of preference on the part of the resident members, and in view of the probable increase in cost of the Technical course, due to the fact that a more expensive hall than that of Columbian University would have to be secured, the Board has decided to discontinue the Technical course during November and December and to omit the Lenten course of the present season. The Popular course at the Congregational Church will be given as heretofore on alternate Fridays, beginning Friday, November 9, 1900.

Membership tickets admitting two persons to the lectures and a preliminary notice of the lectures during November and December will be mailed in a few days.

POPULAR LECTURES DURING NOVEMBER

The course of Popular lectures will be opened Friday, November 9, 1900, by Mr M. H. Saville, of the American Museum of Natural History, New York, the subject being "The Ancient City of Mitla, Mexico." The lecture will be illustrated by lantern slides.

The second lecture will be given by General A. W. Greely, Chief Signal Officer, U. S. A., on Friday evening, November 23, 1900. General Greely's subject will be "A Trip through Alaska."

The lectures will be given in the Congregational Church, corner of Tenth and G streets northwest, at 8 o'clock p. m. sharp.

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Vol. XI DECEMBER, 1900 No. 12

THE

NATIONAL GEOGRAPHIC MAGAZINE

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BY McCLURE, PHILLIPS & CO.,

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National Geographic Magazine

AN ILLUSTRATED MONTHLY

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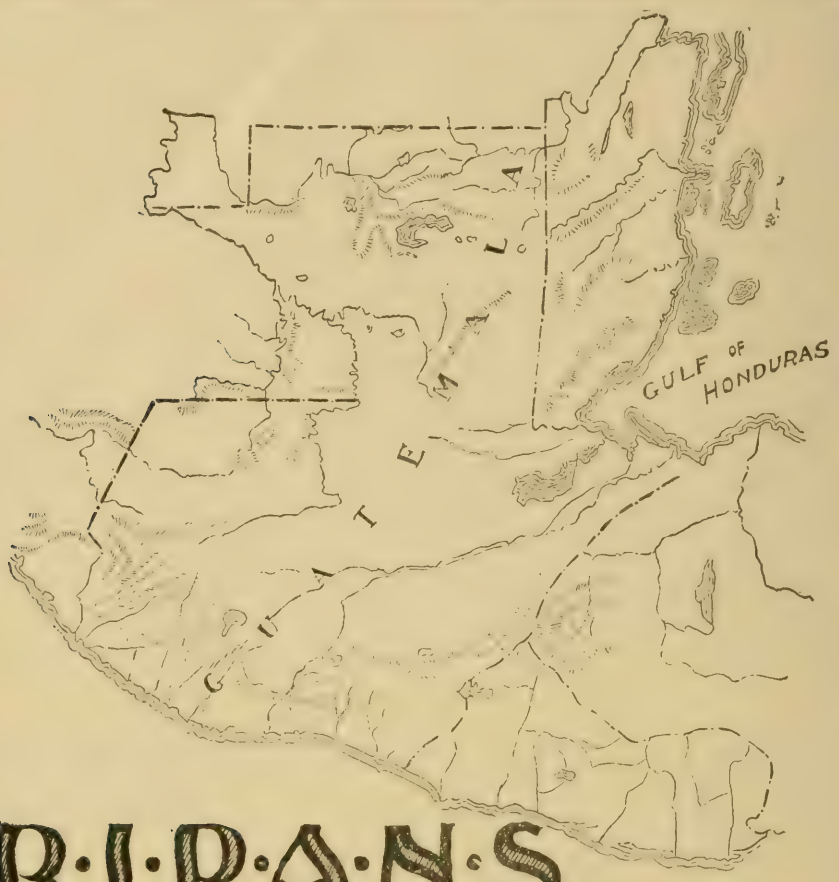

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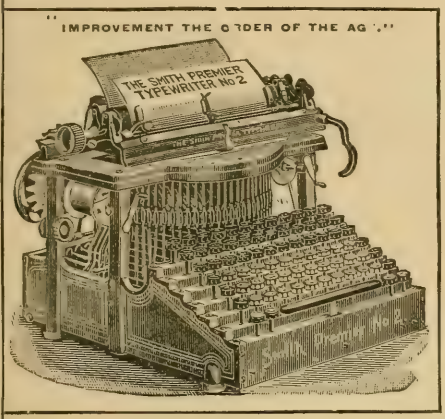

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THE
NATIONAL GEOGRAPHIC MAGAZINE

VOL. XI DECEMBER, 1900 No. 12

THE WYOMING FOSSIL FIELDS EXPEDITION OF JULY, 1899

By WILBUR C. KNIGHT,

Professor of Mining and Geology in the University of Wyoming

There has recently been a renewal of activity in collecting fossil remains in Wyoming. For a number of years, during the '70s and '80s, Wyoming was the most attractive field in the world for the student of vertebrate remains, and the collections then made include some of the rarest and most valuable known to science. From 1890 to 1895 little was done, but a revival occurred in 1897. Owing to the success of the American Museum of Natural History and the University of Wyoming in collecting remains of dinosaurs, Mr E. L. Lomax, general passenger and ticket agent of the Union Pacific Railroad Company, concluded that he could render a valuable service to the scientific world by organizing an expedition on a large scale for the purpose of collecting fossils and studying geology.

Mr Lomax began with the publication of an illustrated pamphlet, which gave in a brief way some information pertaining to the fossil fields and the restoration of some of the important animals that, long prior to the existence of man, inhabited what is now Wyoming. This pamphlet, together with an invitation to join the expedition, was sent in the spring of 1899 to every university, college, and museum of importance in the United States. The invitation included free transportation from Chicago to Laramie, Wyoming, and return, and allowed each institution one professor and one or two assistants. Unfortunately many scientific men had already planned their summer's work and were consequently unable to accept the invitation. Nearly one hundred men, however, availed themselves of this opportunity for study in the Rocky Mountains, and arrived at Laramie, as designated, on July 19.

Upon their arrival the visitors were conducted to the university, which President Smiley had thrown open as headquarters during their stay in Laramie. At noon luncheon was served on the university campus by the camp cooks, and many members of the party had their first experience of camp life. In the afternoon of the same day a permanent organization was effected, and, besides the usual officers, referees were elected for the leading branches of geology, paleontology, botany, zoölogy, and photography.

An unfortunate mistake had been made in connection with the shipping of the tents for the expedition, which were to have been ready for occupancy on the evening of the 19th. Luckily, however, the bedding was at hand, and the weary men were not loath to make up their beds and roll into them, taking their choice between the floor of the university and the campus.

The perfecting of arrangements for an expedition on so large a scale was no easy task, and it was late in the afternoon of the 20th before it was accomplished. That evening an informal reception was tendered the visitors in the university auditorium.

The following morning all were astir very early. Each man was busy selecting such things as he deemed necessary for the journey. The wagons arrived at nine o'clock, and by ten they were nearly all loaded and the leading team had started, heading west and north, across the Laramie Plains. Thus was inaugurated the largest expedition of the kind of which there is any record.

The men composing the party represented almost every State from the Atlantic to the Pacific and from Minnesota to Texas. Some of them had never before slept in a camp overnight, and were entirely unaccustomed to rough camp cooking; many had had no experience whatever of camp life of any sort. The journey from one end to the other, however, was marked by unselfishness, justice, and kindness, and the proverbial "kicker" was consequently unheard of.

It may be of some interest to know how the cooking was done and how the meals were served. The organization was divided into messes of ten men each, and with every mess there were three wagons—two for transporting the members of the party and one for conveying the food, beds, and tents. With each mess there were two teamsters and a cook, so that each formed in reality an independent party. The mess wagons were provided with the western "grub boxes," such as have been used on the plains and in the mountains for many years. The cooking was done on open fires and the baking in a Dutch oven

ON THE MARCH AT COOPER CREEK CROSSING

DIGGING FOSSILS — DUTTON CREEK

a shallow iron pot with a tight-fitting lid, that can be placed upon coals and also covered with them. The meals were served in "cowboy" style—*i. e.*, the whole of the food being cooked, it was arranged about the fire to keep warm, and each man, when the meal was called, took his plate, cup, etc., and helped himself, usually sitting on the ground to eat.

Not all who had accepted the invitation of the Union Pacific Railroad Company joined the main expedition. Representatives from the Kansas University, the Carnegie Museum, and the Field Columbian Museum went immediately to the dinosaur fields. The Northwestern University and William Jewell College parties hired teams and drivers and did their own cooking and camp work, while the Wheaton College party purchased a team and wagon and did its own driving and camp work. The three parties last mentioned were, however, with the main expedition most of the time for 20 days. The latter was composed of 86 men, but when the three semi-independent parties were present there was a total of 102 men.

The first day's march was to have been 20 miles, but through a misunderstanding on the part of the leading team it was extended to 25 miles, when camp was pitched near an alkali pond. It was very late; tents were put up with some difficulty, and supper was eaten after dark. It was an unpleasant beginning, and many felt it keenly.

On the following morning the head cook did not have to call "roll out" at 5.30, as he did in the days that followed. All were up by sunrise, and some even earlier, especially one, who, owning a Winchester, went to the pond before daybreak and, shooting at some ducks, sent a bullet singing over the camp. At breakfast there were many amusing discussions, which were continually interrupted by such questions as, "How did you sleep?" "Was your bed soft?" and other interrogatories relating to the new experience. Those who are unaccustomed to sleeping in tents or in the open air seldom sleep at all the first night out.

The second day's march was a very short one, and before noon the wagon train was winding down the old Government trail to Cooper Creek Crossing, where Camp No. 2 was established. Here there were shade, an abundance of good water, and, best of all, some fossiliferous bands of sandstone. Luncheon was served, and every man in camp armed himself with pick, ax, hammer, shovel, and sack, and hurried across the valley to a bluff less than half a mile away, where invertebrate fossils were to be found in abundance. In a short time the

face of the bluff was nearly covered with collectors, and chips and fragments of stone were flying in all directions, to such an extent, indeed, that it was uncomfortable and almost unsafe to remain in the vicinity. The men labored long and hard, and, while most of them returned to supper, some became so enthusiastic as to forget their meals, until darkness compelled their return to camp. That night the camp fires along Cooper Creek burned brightly, and the stimulus gained by a successful afternoon's study and work engendered a feeling of mirth and jollity that broke forth in story-telling and college songs.

The next day being Sunday, camp was not moved. The wagons, however, were placed at the disposal of the members of the expedition, and many of them drove to the Medicine Bow Mountains, which were only five miles distant, and climbed to snow-line, played snowball, and wandered in the pine forest until they came in contact with an area of fallen timber, through which they did not wander to any extent. The sunshine and dry atmosphere had begun to tell on the noses and lips, and to some extent on the cheeks, of nearly all.

From Camp No. 2 the trail crossed Dutton Creek, passed some local coal-mines, and then followed down Rock Creek, where the topography reminds one more of an eastern valley than of a mountainous country. By the fifth day out the expedition had collected two tons of fossils, which were chiefly invertebrates and fossil leaves.

On the arrival of the expedition at Como Bluff, rendered famous by the work of the late Professor Marsh, enthusiasm was unbounded. It was from this locality that Yale University received its largest amount of dinosaur material. The bluff rises to a height of 200 to 300 feet, and parallels the Union Pacific Railroad for five or six miles, being south of the track, and nowhere over half a mile away. It is capped with conglomerate, and just below this band are the dinosaur beds of variegated marls and clays, plainly visible from passing trains. From these beds Professor Marsh secured his largest dinosaurs, which not only made him famous, but gave Wyoming the distinction of possessing geological graveyards containing fossil remains of the largest land animals that have ever inhabited the earth. The members of the expedition were successful in finding a great many dinosaur bones, and some opened quarries that gave promise of being very valuable. The time spent at this point, however, was so short that there was no opportunity to remove marls enough to investigate even partially the many finds.

FALLS IN THE GRAND CAÑON OF THE PLATTE

BURT CAÑON OF THE GRAND CAÑON OF THE PLATTE

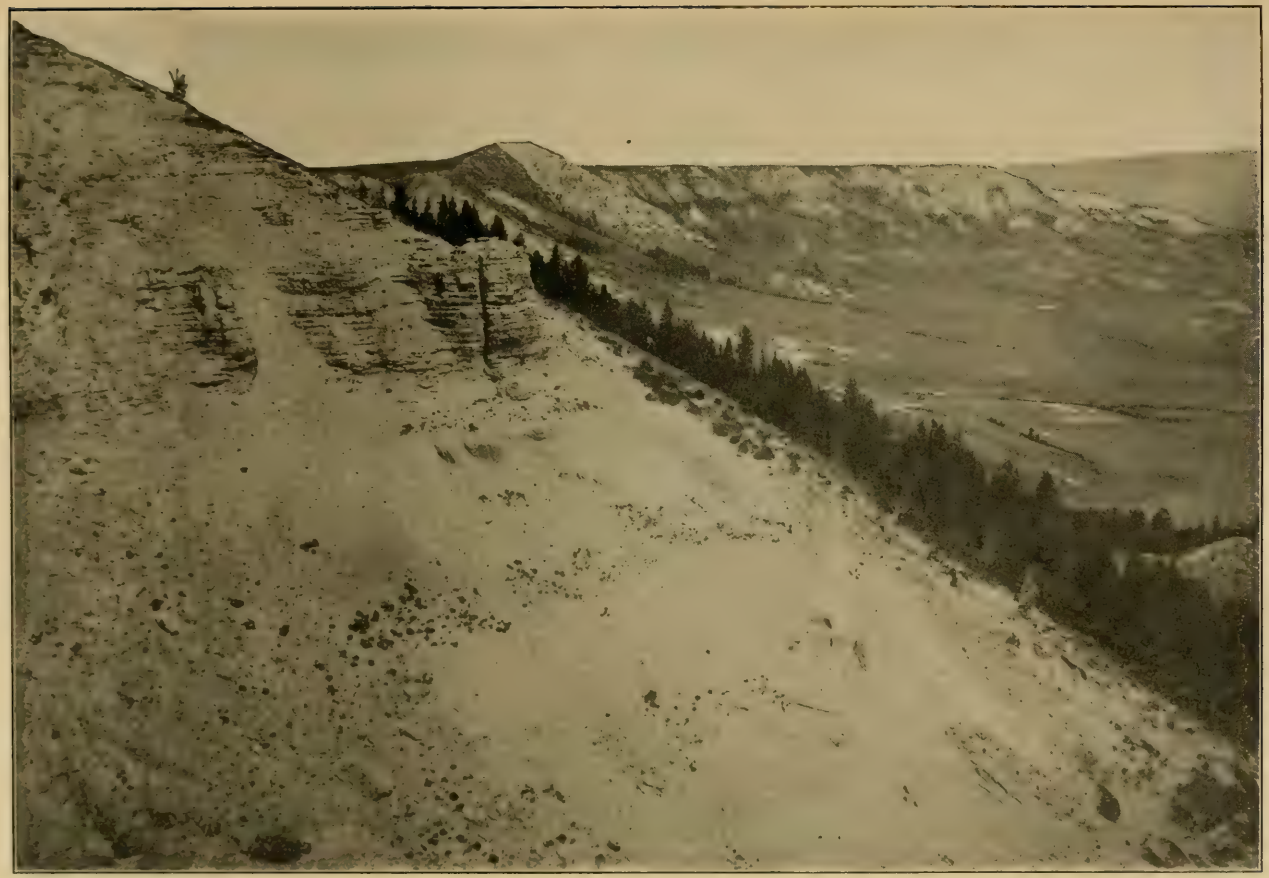
Most of the explorers were by this time beginning to feel anxious lest the Cañon of the Platte, the objective point of the expedition, would not be reached within the time available. The field-work was therefore curtailed and a march was made that followed the railway to Medicine Bow Station, beyond which the Medicine Bow River and the Little Medicine River were forded, and after one camp the Freezeout Hills were reached, which is a new locality for dinosaur collecting. Here the geologist and paleontologist found unbounded opportunities. The various bands forming the great fold in the Freezeout Hills were all uncovered, so that it was possible to study the entire section in minutia. Here were also the quarries of the National Museum, the Field Columbian Museum, and the universities of Kansas, Minnesota, and Wyoming. This being a comparatively new field and the dinosaur beds being exposed for a distance of 10 miles on each side of the camp, dinosaur hunting was the order of the day. Long before sunset on this never-to-be-forgotten 29th of July, men were returning to camp from every direction loaded down with bones; others were seeking teams to haul their heavier loads to camp, and though they worked diligently, it was nearly 10 o'clock before the last load of fossils was brought in. The next day's work unearthed a still larger quantity, the entire shipment from this point amounting to several tons.

The next camps were made in Shirley Basin, on Dry Creek, and the following one on Cottonwood Creek, which is only two or three miles east of the Grand Cañon of the Platte, and is the nearest camping ground convenient for a large party. The cañon had been the principal topic of conversation for several days, and now that we were approaching it, anticipation was at its height, and arrangements were hurriedly perfected for an early morning start. Every man was up in good time, and it is needless to say that no cameras were left behind. After less than an hour's walk the gorge was reached, and the party scattered, each bent upon the discovery of more magnificent views than were found by his neighbor. On that day not less than 500 plates and films were exposed.

This magnificent cañon has never been described. It is hard to account for so perfect an example of a cañon having been passed by, alike by adventurer and scientist, when it is really the grandest piece of scenery to be found near the overland trail between Fort Laramie and Salt Lake. One of the famous camping grounds on this trail is not more than half a day's travel from the gorge, and many pioneers

must have kindled their fires within the sound of its warring waters. Frémont was the only man to mention it in any of the early exploration reports, and there are reasons for believing that he never saw the cañon proper. It was this cañon that Frémont, with five men, tried to pass in a boat. Recently in a conversation with Mr Thomas Sun, a pioneer of Wyoming, the following fact was learned: Descoteaux, who was Mr Sun's adopted father, was one of the men selected by Frémont to accompany him on the supposed perilous boat trip through the Grand Cañon of the Platte. Mr Sun states that Descoteaux often told him about Frémont attempting to run the cañon in a boat, and being swamped in the Sweetwater, long before the cañon proper was reached. To one familiar with the country this story has much greater weight than the one told by Frémont, in which he claims that he abandoned his boat in the main cañon. The cañon is now impassable by boat, except perhaps in very high water, and up to the present time there is no authentic record of any one having passed through it. It is about eight miles in length, and extends from the mouth of the Sweetwater River north and east nearly to Hot Springs Cañon.

The country about varies from rolling uplands to hills, and the cañon sinks so suddenly in the rocks that a mile away one would not anticipate such a gorge but for the sound of its roaring waters. At the place where the Sweetwater enters the main cañon the country is granite, and it remains so for several miles below. One of the very interesting spots in the granite area is about three miles below the mouth of the Sweetwater. Here the walls of the cañon rise almost perpendicularly to a height of 500 feet. The channel below is less than 50 feet in width, and above it is so narrow that even a person unaccustomed to the use of his left hand could easily throw a stone left-handed across the chasm. This is truly a dark cañon, for in many places the sun never reaches the bottom. The river rushes through these walls of granite on edge, with a deafening roar. From the water's edge to a height of about 100 feet the walls of the cañon are water-carved into great pits and projections, and in the highest of these we found remains of flood-wood, proving that the depth at high water must have been at least 100 feet. Below, in the river's path, are natural dams, made by huge masses of granite that the frost has wedged off from the walls. These dams produce rapids and falls through which no boat could pass. From the very narrow gorge the cañon widens, only to narrow again and then to widen out still more



WEST SIDE OF BATES HOLE

DARLOW GATE — EAST WALL OF BATES HOLE

at the point where the sedimentary rocks appear. These rocks are made up of red, brown, pink, and light-colored bands, through which the cañon has been carved, and here one is doubly impressed by the remarkable coloring and the great walls of lime and sandstone, that are nearly 1,000 feet in vertical height. As the river enters the sedimentary rocks it gradually widens, and the stream, that was less than 50 feet in width when passing the narrows, broadens out to about 300 feet as it leaves the cañon. Throughout the entire length of the cañon there are only a few places on the eastern wall where one can descend to the water's edge, and these are all very dangerous and should not be attempted by those unaccustomed to dizzy heights.

By climbing over huge blocks of stone, through dense underbrush, and along narrow, projecting ledges, where one has to cling by his finger-ends for fear of falling a hundred feet or more, one can enter the mouth of the cañon and occasionally reach the water's edge as far south as the sedimentary rocks extend. Here the walls and the water meet, as they do in most of the granitic portions. There is good evidence that several thousand feet of sedimentary rocks have been removed from the granitic area, so this is only the remnant of a greater gorge, whose walls were thousands instead of hundreds of feet high. The Grand Cañon of the Platte is one of Wyoming's finest pieces of scenery—a gem that has been passed by and a place destined in the near future to be one of the famous resorts of the Rocky Mountains.

Everyone was reluctant to bid farewell to Camp No. 9, on Cottonwood Creek, but the journey had to be resumed, and from now on it was toward Laramie, the trail following the rim of Bates Hole to Deadman Gulch, thence skirting the foot of the Laramie Mountains eastward.

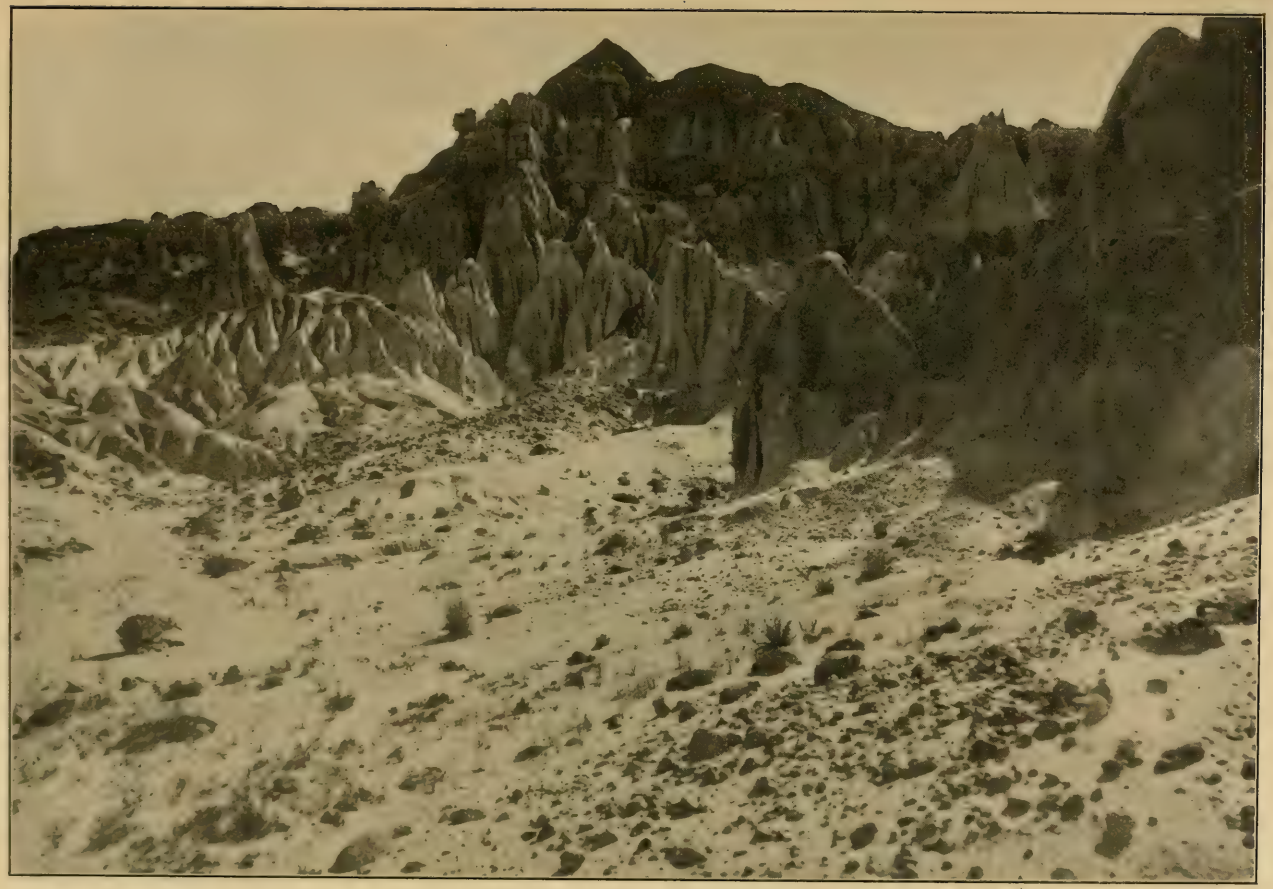
Bates Hole is another instance where a region brimful of geographic and geological interest has been almost entirely overlooked. "The Hole," as it is usually called, was named after a hunter and trapper who formerly had his home there. In reality, it is a great valley that has been eroded out of the soft tertiary beds, and approximates 20 miles in length and from 6 to 12 miles in width. At its southern end this depression is 500 feet and at its northern end 1,500 feet deep. It is surrounded by tertiary rocks that are called "the rim;" but to the east, north, and west, and at some distance away rise mountain ranges varying from 8,000 to 10,000 feet in height. From the rim of this depression the slopes are very precipitous. In

some places they consist of high terraces of castellated rocks; in others the clayey bands have been carved into normal earth slopes; occasionally there are areas covered with a scanty vegetation, and in a few instances groves of pine and spruce. So steep, in fact, are the slopes that for a distance of 20 miles there is but a single wagon trail leading into the valley.

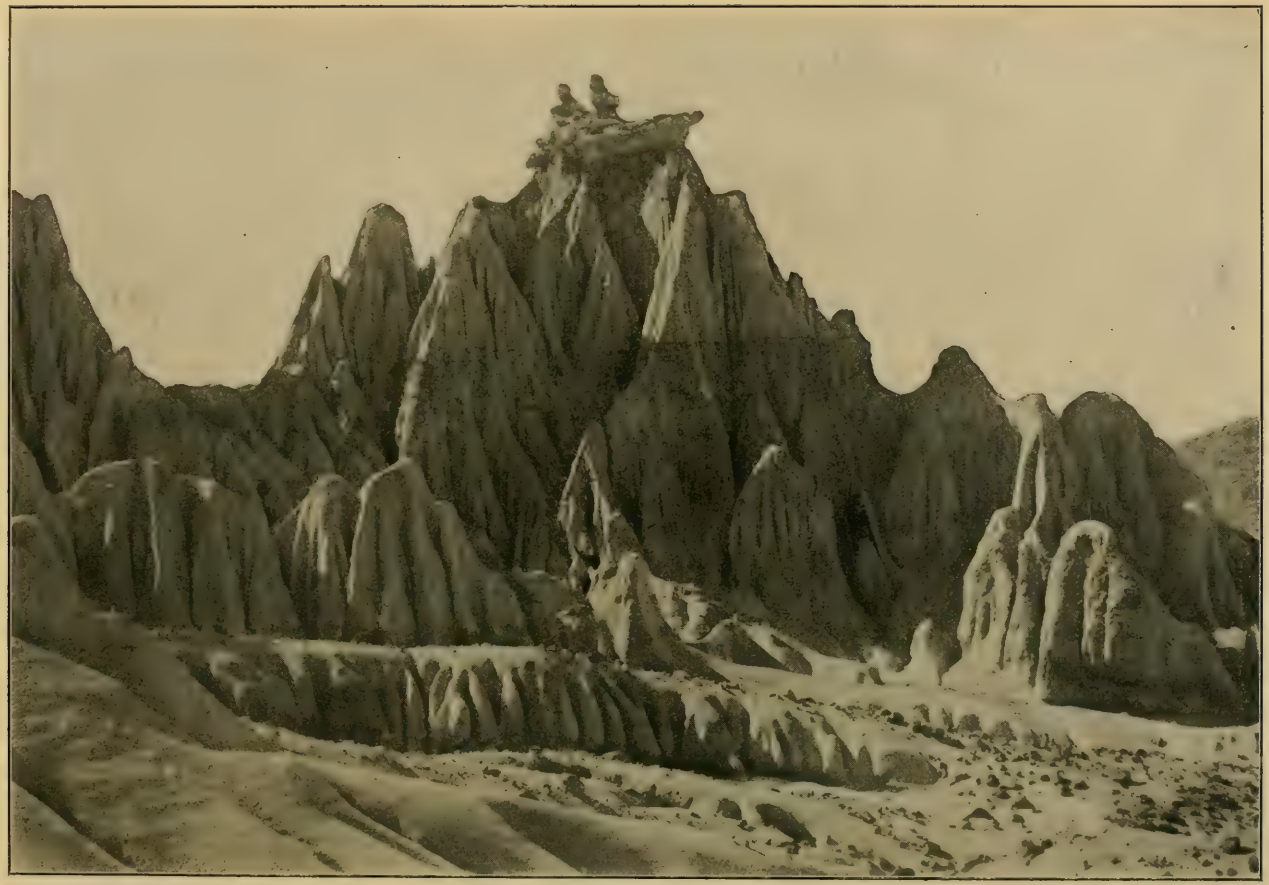
Water is scarce, though one sees a few small streams, with their spruce-clad banks. These break the monotony of the desert and lend a peculiar charm to the entire region. About the "rim" of this great depression, especially on the eastern and western slopes, are some of the most wonderful examples of Bad Land erosion found in America. They are of huge dimensions, rising from a chalky slope to a height of several hundred feet and extending for miles. The carving is elaborate; columns, spires, arches, and gateways are numerous, and their embellishment would do credit to any sculptor. Narrow cañons, with perpendicular walls 200 feet in height, are common occurrences, and add greatly to the attractiveness of the scenery. Here and there are small forests of pine and spruce, and jutting out from their dark green foliage are the white castles whose forms are too varied and complex to admit of description. As the setting sun gilds these broken spires and crumbling walls, and the deepening shadows bring out vividly their intricate designs, it needs no effort of the imagination to see in them the ruins of an aboriginal city which has crumbled away, and whose only occupants are the mountain wolves and lions and their only guard the hooting owl by night and the screaming buzzard by day.

The journey along the Laramie Range was full of scientific interest and large collections of rock and minerals were secured. Laramie Peak, the oldest landmark in the Rocky Mountains, was scaled, and other places of note along the western flank of the Laramie Mountains were visited. After being in the field 39 days the expedition returned to Laramie all well and in the best of spirits. Although there were many in the party and but few acclimated, there was no serious sickness during the trip. No accident occurred and no delays were occasioned by breakdowns or the loss of horses.

The results of the work accomplished will appear from time to time in scientific journals, as the discoveries are worked up; but the discoveries themselves are not all that should be considered of value. The field experience has deepened the interest and broadened the horizon of every member of the expedition. Young and old were



TERTIARY EROSION NEAR BEAR CAÑON



CASTLE LOMAX

alike enthusiastic over the opportunities offered by this region for field-work in geology. While they returned to their various spheres of duty enriched with material for use in their future class-work, they all carried home with them that lasting benefit and stimulus which are derived from contact with the keen minds of those working along similar lines of research under more or less varying conditions.

The courtesy of the Union Pacific Railroad Company will long be remembered by every member of the expedition. In many cases it made attendance possible where otherwise the expense of a long railroad journey would have been a difficulty that could not have been overcome. It is to be hoped that other railroad companies will follow the example set by the Union Pacific and take some suitable opportunity of furthering the interests of science by facilitating research in some region of geographic and geological interest.

GOLD IN THE PHILIPPINES

By F. F. Hilder,

Bureau of American Ethnology

In an article which I wrote for the National Geographic Magazine in 1898 * I referred to the existence of gold in the Philippine Islands in the following terms:

"Gold has been found in several of the provinces, but chiefly in the more mountainous and inaccessible localities, many of which are occupied by independent tribes that have never submitted to Spanish rule; but that the auriferous formations extend over a wide area in the island of Luzon is proved by the fact that in the alluvial deposits of every stream on the Pacific side some color of gold can be found. The islands of Mindanao and Mindoro are also equally promising fields for prospectors of gold. In many places the natives have extracted considerable quantities of gold dust by washing the alluvial deposits; in others gold-bearing rock is broken by them with hammers and ground in rude mills, such crude methods, of course, producing but poor results."

During the present year I have again visited the Philippines, and, although existing conditions were such that I could not personally visit the gold-bearing districts, I was enabled to obtain considerable information with respect to them from sources which I consider to be thoroughly reliable, and have inspected a number of samples of

* National Geographic Magazine, vol. ix, No. 6, June, 1898.

gold obtained from different localities. In the island of Luzon there are few provinces in which gold does not exist in greater or less quantity, in veins and ledges in the mountains or in the river sands and alluvial deposits.

One of the best known auriferous districts is that of Paracale, in the province of Camarines Norte, on the eastern coast of Luzon, where in the spurs of the mountains many veins and outcroppings of gold-bearing rock have been uncovered, particularly at Pinagalatinan, Imbongimbong, and Lugos, near Labo. In the former places the gold is in combination with iron pyrites, with a trace of copper, blende, galena, and chromate of lead in orange-colored crystals. In Labo the streaks or veins are gray in color, containing gold, blende, iron pyrites, and sometimes, although seldom, native copper. The general direction of these strata is from north to south, except in Gumihan and Lugos mountains, in which the trend is to the northwest. The width of the veins is from 1 to 5 inches up to 26 to 36 inches. Foreman mentions this district as follows: *

"In the time of Pedro Manuel Arandia (1754–1759) a certain Francisco Estorgo obtained license to work these Paracale mines, and five veins are said to have been struck. The first was in the Lipa mountain, where the mine was called 'San Nicolas de Tolentino;' the second, in the Dobójan mountain, was called 'Nuestra Señora de la Soledad de Puerta Vaga;' the third, in Lipara, was named 'Mina de las Animas;' the fourth, in the territory of San Antonio, took the name of 'San Francisco,' and the fifth, in the Minapa mountains, was named 'Nuestra Señora de los Dolores,' all in the district of Paracale, near the village of Mambulao."

He also says: †

"Estorgo's neighbors, instigated by native legal pettifoggers in Manila, raised endless lawsuits against him; his means were exhausted, and apparatus was wanted to work the mines, so he abandoned them."

These mines are at present operated by the natives, but in such a rudimentary and desultory manner that only a small portion of the gold is saved. The workings are seldom carried to a greater depth than 3 or 4 meters, but it is a fact which promises better results, whenever more scientific and practical methods may be brought to bear on them, that the ore always becomes richer as the depth is increased; but in all the hundreds of years during which these deposits have been known it is safe to say that their true value has never been tested. The natives carry the ore to the surface in baskets, and when water

* The Philippine Islands, by John Foreman, New York, 1899, p. 380.
† Op. cit., p. 381.

is struck they bale it out with buckets, either pulling them up with a rope or carrying them up a bamboo ladder. The gold-bearing rock is emptied from the baskets into a concavity in a rock or large stone, which serves as a mortar. The pestle or stamp consists of a stone about 25 pounds in weight, which is tied with a strip of bejuco to the end of a slender pole, which is rested obliquely against the fork of a tree. The laborer, taking advantage of the elasticity of the pole, uses it like a trip-hammer, and crushes the rock. The broken rock is then pulverized in a rude mill, consisting of a rough stone roller, which is revolved in a circular base by means of buffaloes. The pulverized material is then washed, generally by women, until there remains only a dark sediment, which is afterward smelted by placing it in a shell, covering it with charcoal, and using a small piece of bamboo as a blowpipe.

A sample of the metal obtained by this imperfect process gave the following analysis:

Gold	77.94
Silver	19.00
Iron	.05
Silica	3.00
Loss	.01
	100.00

Of course, the quantity of gold obtained is a very small fraction of that carried by the ore, and as the gold is bartered to Chinese peddlers and ambulant traders, the producers get but small return for their labor and are miserably poor. The ground between the mountains and the coast is mostly alluvial, and the village of Mambulao, in this district, has long been noted for the placer washings in its vicinity.

In the adjoining province of Tayabas gold has also been found in the hills or mountains around the town of Altimonan; also in many of the spurs of the Caraballo mountains, in alluvial deposits in the Gapan country and in the sands of the rivers Ango and Angalacan, in the province of Nueva Ecija, and in many places in the Caraballo de Baler country between that province and that of Nueva Viscaya. On the island of Polillo, lying off the east coast, it has also been obtained from the shores of the river of the same name. In the north of the province of Cagayan it has been found in the districts around the town of Pamplona; in the townships of Lanag and Bangui, in the province of Ilocos Norte; in the sands of the river Abra, which

discharges near the town of Vigan, on the coast of Ilocos Sur. It has also been found in many places in the country inhabited by the Igorrotes and Igorrote-Chinese, in the district of Benguet, particularly near the villages of Gatapa, Bagnio, Capunga, Lutal, Automac, and Pangotcotan, near the latter of which some mines were worked by Mexicans during the last century; in the township of Batincoquin, in the north of Zambales province; in the rivers near the towns of Santa Maria and San Jose of Bulacan; in the Tierras de Caramoan, in the province of Camarines Sur; in the township of Ligao, in Albay; in the rivers of Lanating and Cayguran, in the province of Morong, and in the ravines and creeks of Macaburaboc and Camandag, near the town of Montalban, in the province of Manila. It will thus be seen that gold is widely distributed throughout the island of Luzon; how many of these deposits will prove to be rich enough to pay for systematic work and the introduction of machinery remains a problem which the future must solve, but I know that the owners of some of them are sanguine of securing good results whenever the country may be pacified and capital and labor shall be protected under American control.

In the great southern island of Mindanao gold has been found in many places, principally on the northern and eastern coasts, where its production has been entirely in the hands of the natives. What may exist in the interior is problematic, as the greater part of the island is unexplored. In the district of Misamis, in the northwest, there exist many alluvial diggings in the country between the Cagayan and Iligan Rivers. The principal placers are near the towns of Initao and Iponan, where nuggets have been found weighing as much as 1 to 2 ounces. In the neighborhood of Pigholugan, near Cagayan, small veins of auriferous quartz exist, from which, even by the crude native methods, considerable quantities of gold have been taken.

The gold-bearing district of Surigao may be considered as an eastern continuation of that of Cagayan de Misamis, and is of more importance, including the greater part of the district of the Canimon, Binutong, and the Canmarhat Mountain and the plains of Caningay. There are also deposits in Magong-Duangan and Danas, in the township of Caganan; placers in the township of Tibabangan, near Maquit, on the edge of Lake Sapongan; in the Tubay River, which discharges into the Bay of Butuan; also about four days' journey from the mouth of the Butuan River, near the villages of Lines, Finon, and Sulibas. In the veins and outcroppings in this district the gold is found mingled

with pyrites of iron and copper, galena, and blende. I have seen a report in which it was stated that in a ledge near Canimon there had been found ore so rich that as high as 100 ounces of gold had been obtained from 75 feet of the vein.

The productiveness of this Surigao district has been known for centuries, but for many reasons the extraction of gold has remained in the hands of the natives. Foreman says:*

"A friend of mine, a French merchant in Manila, told me, in 1886, that for a long time he received monthly remittances of 4½ to 5½ pounds of alluvial gold from the Surigao coast extracted by the natives on their own account. In the same district a Spaniard attempted to organize labor for gold, washing on systematic principles, but he met with such opposition from the friars, who influenced the natives, that he could only have continued his project at the risk of his life, so he gave it up"

Sir John Bowring also mentions the Mindanao gold production:†

"Gold dust is the instrument of exchange in the interior of Mindanao, and is carried about in bags for the ordinary purposes of life."

While I was in Manila in April last (1900) Mr G. E. St. Clair, a mining engineer and expert of considerable experience, returned from a trip to the southern islands. He said that from the result of his investigation he regarded the island of Mindanao as one of the richest countries he has ever visited, considered from a mineral standpoint.

Gold has also been found in the island of Panay. The most notable locations are those in the vicinity of Astorga, in the township of Dumarao, in the beds of the creeks known as Calaomin and Dinogo. In this neighborhood are found dioritic rock containing numerous small veins of gold-bearing iron pyrites, rich enough to pay for working. Deposits of gold exist in Binatusan and Lausam below Mantubang; also in the country between the junction of the rivers Manyon and Badbaran with the river Panay. In the province of Iloilo the most noticeable gold deposits are those in the Abaca section of the township of San Curique and those in the township of Baratoc Viejo, in the northeast of the island, which are reported to be very rich.

This description includes the best known gold-bearing localities; but indications in several other islands, such as Cebu, Mindoro, Masbate, Negros, Palawan, and other smaller islands, are such as to lead to the belief that the metal will be found in them whenever they may

* Op. cit., p. 382.

† The Philippine Islands, by Sir John Bowring, London, 1859, p. 279.

be explored and prospected. The reasons why the gold deposits in the Philippines have never been exploited or properly utilized are so many and so varied that no adequate relation of them can be given within the limits of a magazine article. Some of them are, however, summarized in the following extract from Foreman's book:*

"As a general rule, failure in most Philippine mining speculations, no doubt, was due to the unwillingness of the natives to coöperate with European capitalists, and in this they found encouragement from the friars, who were averse to innovation of any kind. The native, too, in rural districts, would not submit to constant organized and methodical labor at a daily wage, to be paid periodically when he had finished his work. The class of natives whom one had to employ in the neighborhood of the mines was nomadic and half-subjected, whilst there was no legislation whatever in operation, regulating the relations between workers and capitalists. Indeed, the latter were quite at the mercy of the former, whose indolence entirely overcame their cupidity, so long as their immediate necessities were satisfied." . . . "Again, the wretched means of communication provided by the Spanish Government obliged the few enterprising capitalists to spend their money on the construction of roads which had already been paid for in taxes."

It is to be hoped that after centuries of oppression, misrule, apathy, and neglect a better and brighter day is dawning for these beautiful islands, when their abundant stores of mineral and vegetal wealth will be developed and utilized, when both capital and labor will be encouraged and protected, not only in the interest of the former, but to the immeasurable benefit and advancement of the people who will supply the latter.

THE TEACHING OF PHYSICAL GEOGRAPHY IN ELEMENTARY SCHOOLS

By Richard E. Dodge,

Teachers College, Columbia University, New York

One of the perplexing problems of supervisors and superintendents of schools and of all others who have to plan and set in operation an effective school curriculum is that of determining the position of physical geography in elementary school work. Five years ago educational leaders were as a rule willing and indeed eager to incorporate almost any amount of physical geography in their school courses

*Op. cit., p. 384.

and to emphasize it even in the earliest years of school life. With the accumulation of experience and with the increased emphasis given in school work to the so-called "socializing" of the child, the tendency unfortunately has been to allow the pendulum of practice to swing far away from rational physical geography, until in many instances school geography has come to be, not "a study of the earth in its relation to man (and life)," but a study of man, with occasional reference to the earth.

There is no doubt that both extremes have been unfortunate, and that the cause of physical geography, as well as that of industrial geography, has suffered through over-advertising and exploitation. It will only be a question of time, however, when the interest of the moment, passing to some other subject in the curriculum, the pendulum will return to its normal position, and all phases of school geography will receive their due amount of attention, and no more.

In the mind of the writer, physical geography has a right to a large amount of consideration in elementary schools. It must not, however, be taught as an end in itself, but as a means to an end, and that end, in the upper grammar grades, should be the causal understanding of geographical conditions over the world. Physical geography also has a place in the work of beginners in geography; but its place is not all-important. It must be brought in slowly as an entering wedge that shall be driven deeper as needs may require during the succeeding years, but which shall not be driven "home," perhaps, until the later intermediate years.

There are a few guiding thoughts that one planning a course of study may well bear in mind, which seem to have their bearing on the vexed question under consideration. In the first place, neither the geographical expert nor the pedagogical enthusiast is necessarily qualified to decide upon the place and amount of attention that physical geography is to receive in the school curriculum. The geographer may think only of the scientific ordering of his subject-matter, and may be over-anxious to train embryo scientists rather than to train children scientifically, so that they will understand and think about the geographical conditions about them and be ready and able to seek for new information and fuller knowledge. The child may, in consequence, be top-heavy from an overload of scientific study of land forms and climate.

On the other hand, the teacher who believes that child study has already proved to us the supreme interests of children at all ages, or

who is convinced that "training for citizenship" or the study of "social dependence" demands the early emphasis of civics and a detailed study of industrial processes, may tell us that children have no interest in their relation to their physical environment; that they have but little need for the facts of physical geography (the stage) in order to understand human activities and progress (the play).

The leader in child study may very rightfully emphasize the need of being guided by children's interests and of making our school work serviceable. This does not mean, however, that we must follow children's whims or omit all that is not of immediate practical use in everyday life. It means that the interests of children must be ascertained, so that we may lead them forward from the unrelated known to the causally related known (or unknown) in such a way as to give them knowledge of important facts and principles and the ability to apply these facts and principles in everyday life. It means also the laying of the foundations of future culture by giving the children an insight into the unsolved problems of geography, and, further, it means training them "for citizenship" through making them logical and accurate in their thinking, open-minded toward the problems of the day, able to reach a decision and act on it with force and common sense. Physical geography introduced and developed with care, and gradually made the basis of other geography work, can do more than any other science that has a place in the elementary school curriculum in giving a training for intelligent citizenship.

The arrangement of the facts of physical geography in the elementary school must be decided by the scientist, the leader in child study, and the practical teacher working together. The scientist should determine the field to be covered and, in a general way, the order of steps to be followed in the work, and should see to it that the pupils receive training in accurate and scientific thinking; the child-study expert should be able to show how the selected facts may be used with the greatest effect and the least waste of energy on the part of teacher and pupil; and the practical teacher, who knows his children better than any one else, and who alone sees the practical possibilities, should select the details, arrange them so as to be of the greatest value and assistance in the development of the pupils, and yet so rationally that neither the pedagogical expert nor the geographer can offer valid criticism or rebuke.

The way will be made more easy if, so far as possible, in physical geography, as in other subjects, the children be led forward so gradu-

ally and systematically that need is developed for a fact or a principle before it is presented. Children should be led and not driven to the study of geographic controls. To follow such a progressive plan means in the early years a different method of study from that in the later years, when the children can work longer at a given task without variations, and when they can think more logically and consecutively. Whatever is done at any stage should be done in such a way that causes and consequences are necessarily related, though it is wise to remember that the consequences that deserve emphasis are not always the physical, but more often the human consequences following certain physical causes. In the earlier years pupils may study the consequences and gradually be led to see the fundamental causes of topography, climate, drainage, etc., that exercise a control over life. Such a plan rightfully followed should give good, practical mental training, should keep uppermost the human phases of the subject, and throughout a need may be created in the children's minds for a more thorough study of the causes in later stages.

Such a study of the physical facts in a somewhat extensive manner naturally follows, and in turn the elements of physical geography should be followed by a more full and careful study of the consequences of the present and past time, that can only be really appreciated as they are seen in the light of their environment. We might express it in some such way as this: that in the early years the children should be led to see some causal arrangement in the apparent chaos of physical, industrial, and social conditions with which they are always surrounded, thereby laying the foundations and the need for the study of pure science—the causes. After the causes have been elaborated as fully as time and the needs of the pupils allow, the pure science (physical controls) should be made the basis of work, so that the applied science (history, civics, and social conditions) may be taught understandingly.

It is not intended to imply here that present social conditions are entirely due to the physical environment, but that the physical environment should be given the emphasis due it in each case; that where physical controls are important, for instance, in determining a boundary, they be noted, and when politics have fixed a frontier, that the failure to follow the natural boundary be also noted and accounted for.

One advantage of such an inversion of the plan of procedure is the variation in method of study as the years go on. Geography in the

upper grades thus taught is not merely a duplication of the work of the earlier years, with more details to create work for pupils; it becomes more rich and more full of significance, and the method may be made so different that pupils hardly realize they are covering the same ground. Instead of the circle outside a circle, or concentric method, it may be said that a circle is drawn in the early years; that then the circle is turned inside out, like a glove, and that the later work is built around it.

Furthermore, such a plan allows the human conditions to be emphasized in the earlier years, when the children are as a rule interested in what people are doing. It should be noted, however, that they are also interested in *why* people do certain things, which is one of the reasons for leading from consequences out to causes. As soon as we can get a *why*, there is a logical reason for giving the causes, and our children are thinking ahead and creating a need for more and richer food. They cannot become parrots or mere absorbing sponges. Children do not ask *why*, however, until they have seen the fact to be explained, which suggests that the study of consequences should precede the study of causes in the early years.

The method briefly suggested as pertinent to the more advanced years, when properly put in operation, demands a use of physical geography that renders it unnecessary to have a special course in physical geography in the earlier high-school years. Many facts must, of course, be omitted that might be included in a first-year high-school course; but all the necessary physical controls of life may be studied scientifically and thoroughly, and made permanently of value through being applied and used in everyday school work, so that the scientific study of physical geography as such may be deferred until the later years of the secondary schools. Such a plan, furthermore, allows the best ideas of all leading schools of geography teachers to be woven together in such a way as to prevent one-sidedness, while ensuring good, thought-provoking work that is of practical, everyday value, and, further, that lays the foundation for later, better work. With such a plan, neither the physical geographer, the commercial geographer, nor the sociologist can rightfully claim that the pertinent facts of his field have been neglected until the children are dulled to their beauty and importance.

The working out of a course of study so that the attention given physical geography shall gradually be increased in amount and in significance as the years advance is not an easy task. From the

whole field of physical geography there must be selected those facts that are of the greatest value; these facts must be arranged so that progress is assured without over-repetition, and must be related to the conditions of which they are the causes, so that the knowledge of both causes and consequences is enriched through such a causal study. A course of study planned along these lines is now in operation in the Horace Mann School of Teachers College, and is proving itself rational and effective. The more important facts of physical geography are developed by the middle of the sixth year in school, as the natural outgrowth of a study of life conditions. In the remaining work of the geography course physical geography is made fundamental, and good history and good geography will result. By the end of the eighth year the pupils have gained a good insight into the earth sciences and have had such training in scientific thinking that no more geography work is advisable until toward the end of the secondary course. By the third or fourth year of the high school course it is possible to take up a study of physical geography that answers the requirements in physiography for entrance to Columbia and Harvard Colleges. Thus the arrangement of geography below the college, that Professor Davis has recently stated would be in fashion twenty or thirty years hence,* has been proved a very successful possibility. The primary essential of such elementary school work is that the teachers, who cannot be experts in all things, shall at least know more geography than their pupils are expected to know on entrance upon a secondary course. This necessity may be acquired at the end of another generation, but progress will unfortunately be slow.

GEOGRAPHY AT THE BRITISH ASSOCIATION

Geography occupies a much more conspicuous place in the proceedings of the British Association for the Advancement of Science than in those of the American Association. There is never any lack of valuable papers to be presented, and almost every meeting has its special attraction in the fact that some newly returned explorer avails himself of the opportunity of narrating before a large and distinguished audience the story of his discoveries and adventures.

* Physical Geography in the High School, School Review, Sept. and Oct., 1900.

The Bradford meeting of 1900 formed no exception to the rule, being one of the most successful in recent years, both from the popular and scientific standpoints. A large audience greeted the president of the section, Sir George S. Robertson, of Chitral fame, when he rose to deliver his address on Political Geography and the Empire, while still larger audiences thronged the hall when Mr C. E. Borchgrevink gave his description of the British Antarctic Expedition of 1899–1900, the first expedition that ever wintered on land within the Antarctic circle, and Captain H. H. P. Deasy described the incidents of his great journey in central Asia.

Of the miscellaneous papers, two, at least, had an interest extending far beyond the audiences to which they were primarily addressed. The first place, from an American standpoint, should be given to Mr G. G. Chisholm's paper on Some Consequences that may be anticipated from the Development of the Resources of China by modern Methods. The author pointed out that China is the only region in the world with all the means for industrial development on a gigantic scale that remains to be opened up. The countries that have been opened up within the past thirty or forty years have none of them possessed great resources for industrial development. Among the important results that may be expected to follow the adjustment of the present disturbed conditions in China the author mentioned:

1. A rise in prices in China, especially in the industrial regions.

2. The creation of a demand for foodstuffs not likely to be supplied by China itself, a demand which in itself will be one of the most powerful causes contributing to maintain the rise in prices.

3. The imparting of a great stimulus to the food-producing regions most favorably situated for meeting this demand, more particularly Manchuria, Siberia, and western North America, probably the Pacific States of North America to a greater extent than Canada.

4. Perhaps the most important of all, the creation of a tendency to a gradual but prolonged rise in the price of wheat and other grains all the world over, thus reversing the process that has been going on since about 1870 in consequence of the successive opening up of new countries.

Another important paper, read by Mr T. G. Rooper, one of Her Majesty's inspectors of schools, dealt with the Progress of Geographical Instruction in Elementary Schools. The following, he said, were the principal defects in the existing methods of instruction: (1) Lessons in geography were not based on object teaching, nor on the

observation of local features and scenery; (2) the art of "reading" maps was not taught, nor was the construction of a map led up to by making plans of short walks and diagrams of the neighborhood; (3) the study of political and commercial geography was not based upon the study of physical geography, neither were the details of geographical study connected as cause and effect. There was no attempt to present a country to the scholar as a connected whole, and the lessons consisted of lists of names and figures, at the best arranged in groups. The chief reforms consisted, said Mr Rooper, in the intelligent study of local geography through local maps and models, and in object lessons which explained the principles of physical geography. The reliefs and models led up to the art of reading maps and to the demand for better maps. Such lessons were an excellent introduction to reasoning, and proved how little there was that was purely arbitrary, even in the sites of towns and villages in the neighborhood, much less in the industries which were carried on in them. The symbols on wall maps were vague and meaningless unless a context and significance were given them by previous practice in the building up of local plans and maps. The scholar should be carefully taught how to translate the symbols back into the forms of nature which they inadequately represented. The value of graphic work in the teaching of geography was strongly emphasized. The mere copying and coloring of maps by the pupil was rather an exercise in drawing than in geography. Each map should be drawn to serve some definite purpose. It should disentangle from a complex whole some particular part which analysis brought to light, and illustrate it with precision and simplicity. Further, the sketch maps should proceed from the simpler to the more complex, and no map should be made of a country as a whole until the leading features had been dealt with separately, the constructive method being thus applied to the teaching of geography.

The delicacy of the instruments now used for the detection of earthquake disturbances was thoroughly appreciated by the audience to which Prof. J. Milne made the surprising statement that no fewer than 130 earthquakes were recorded at Shide, in the Isle of Wight, last year. Of these disturbances, 125 had suboceanic origins, the Pacific origins being, with the possible exception of one group, on the face or at the bottom of those remarkable "deeps" which are found along the eastern and western margins of that ocean. Professor Milne stated that as there are reasons for believing that each of the

earthquakes was accompanied by large mechanical displacements of solid materials, the safety of the deep-sea cable systems of the present and the future calls for the definite localization of the regions of most frequent and serious disturbance. Analysis of earthquake records has increased our knowledge respecting the rates at which motion is transmitted through the earth, and indirectly thrown new light upon the earth's rigidity. The distance of a place of origin from a given station can now be determined, either from the interval by which the preliminary tremors outrace the larger surface waves, or from the interval between the arrivals of waves which have traveled from their origin round the world in opposite directions.

Among other noteworthy papers to which only passing reference can be made were Mr E. G. Ravenstein's on Foreign and Colonial Surveys and on the Geographical Distribution of Relative Humidity; Dr H. R. Mill's on the Treatment of Regional Geography, which seems to have brought out a general expression of opinion that the most convenient unit for such descriptions is the county rather than the map-sheet, and Sir Thomas Holdich's discussion of Railway Connection with India. These, however, are only a few of the interesting topics to which the attention of the Section of Geography was directed, and it is impossible to look over the report of the proceedings without a feeling of regret that in our own American Association there is no separate section devoted to a science that alike on its physical, its economic, and its political sides is of the most profound interest and consequence to the people of the United States.

J. H.

DECISIONS OF THE U. S. BOARD ON GEOGRAPHIC NAMES

The following are the decisions rendered by the U. S. Board on Geographic Names at its eighty-sixth meeting, held October 10, 1900. The decisions rendered at the eighty-fifth meeting, held June 5, 1900, were printed in the NATIONAL GEOGRAPHIC MAGAZINE for August, 1900, pp. 329–330. All prior decisions, covering a period of about 10 years, are contained in the Second Report of the U. S. Board on Geographic Names, printed by Congress last May as Senate Ex. Doc. No. 472, 56th Cong., 1st session. The Board has no copies of this report; application should be made to Members of Congress.

Ansley; island in Swanson Harbor, Chatham Strait, S. E. Alaska. (Not Astley.)

Carmichaels; borough and post-office, Greene County, Pa. (Not Carmichael nor Carmichael's.)

Catlin Mill; creek, branch of Catharine Creek, Schuyler County, N. Y. (Not Catharine Mills.)

Chilson; lake, Essex County, N. Y. (Not Long Pond nor Paragon Lake.)

Cliff; point on southeastern shore of Pearse Island, Portland Inlet, S. E. Alaska. (Not Base nor Rose.)

Coatue; beach and point, Nantucket Harbor, Nantucket, Mass. (Not Bogue, First, nor Hanloetoe.)

Cone; mountain on east bank of Stikine River near the Alaska-Canada boundary. (Not Cane.)

Coskata; beach, life-saving station, and pond, Nantucket, Mass. (Not Coskaty nor Croskaty.)

Emmet; post-office, railroad station, and township, Nevada County, Ark. (Not Emmett.)

Entiat; river, Chelan County, Wash. (Not En-ti-at-kwa, Entiatqua, etc.)

Gravette; post-office and railroad center, Benton County, Ark. (Not Gravett.)

Green; point, the northern point of entrance to Pyramid Harbor, Lynn Canal, S. E. Alaska. (Not Pyramid nor Zelonoi.)

Gross; point, the west point of entrance to Orland River, Hancock County, Me. (Not Gross's, Leach's, nor Spark's.)

Katzehin; river tributary to Chilkat Inlet, from the east, S. E. Alaska. (Not Chkazhīn nor Katsehin.)

Labouchere; island at entrance to Labouchere Bay, Sumner Strait, S. E. Alaska. (Not Ship.)

Leake; township, Nevada County, Ark. (Not Lake.)

Lone; mountain on and near north end of Admiralty Island, S. E. Alaska. (Not Barlow.)

Maxey; pond, Nantucket, Mass. (Not Maxcy.)

Napean; point on southeast shore of Admiralty Island, S. E. Alaska. (Not Nepean nor Nepken.)

Nobadeer; pond, Nantucket, Mass. (Not Nebadeer, Nobadee, nor Nobodeer.)

Poaha; island in Mono Lake, Mono County, Cal. (Not Anna Herman.)

Pimnys; point, Nantucket Harbor, Mass. (Not Pimney's.)

Polpis; harbor and village, Nantucket, Mass. (Not Poadpis nor Podpis.)

Red Bay; mountain in northern part of Prince of Wales Island, S. E. Alaska. (Not False Mount Calder.)

Rheas Mill; township, Washington County, Ark. (Not Rhea Mills.)

Sail; island off False Point Pybus, Frederick Sound, S. E. Alaska. (Not Ship.)

Sanford; cove in Endicott arm of Holkham Bay, S. E. Alaska. (Not Sandford.)

Scull; islet in Young Bay, Stephens passage, S. E. Alaska. (Not Skull.)

Shimmo; point, Nantucket Harbor, Nantucket, Mass. (Not Abram nor Shemo.)

Spruce; island off Pybus Bay, Frederick Sound, S. E. Alaska. (Not Yelowy nor Yellowy.)

Starr Hill; township, Washington County, Ark. (Not Starrhill.)

Sumdum; island in Endicott arm of Holkham Bay, S. E. Alaska. (Not Sand nor Soundon.)

Trots; hills, Nantucket, Mass. (Not Trott's.)

Weweeder; ponds, Nantucket, Mass. (Not Weedweder nor Weeweder.)

Whitley; township, Crawford County, Ark. (Not Whitney.)

Wigwam; pond, Nantucket, Mass. (Not Toochka nor Toupchue.)

SOME SIGNIFICANT FACTS CONCERNING THE FOREIGN TRADE OF GREAT BRITAIN

Mr Michael G. Mulhall contributes to the June number of the *Review of Reviews for Australasia* an article on the subject of British trade, which presents some facts of far-reaching significance with great clearness and force. The article is summarized by the author in ten paragraphs, which are substantially as follows:

1. The weight of the merchandise annually imported into Great Britain has multiplied fivefold in forty years, averaging at present more than one ton yearly for each inhabitant.

2. More than half of the food supply of the United Kingdom is drawn from other countries, at an annual cost of about £5 ($24.33) per inhabitant.

3. The mean price of imported food is now only £12 10s. ($60.83) per ton, having fallen 20 per cent in the last twenty years.

4. Most of the imported food could be raised in England, but at much greater cost, to the detriment of the working classes.

5. The consumption of fiber in the mills of Great Britain has doubled in thirty years, and exceeds the aggregate consumption in France and Germany.

6. The importation of metals and minerals has grown elevenfold in thirty years, and the exports of hardware manufactures have doubled in value.

7. The consumption of manufactured goods imported from foreign countries has risen from 15s. ($3.65) per inhabitant in 1869 to 41s. ($9.98) in 1899.

8. The value of textile goods exported is less than it was thirty years ago, but the volume has risen 70 per cent.

9. The fall of prices has been a gain to Great Britain of at least £50,000,000 ($243,325,000) per annum.

10. The tendency of British trade points to a steady increase of food imports and of hardware exports.

THE recent dredging of the Dniester has rendered the river navigable by barges for a distance of 70 miles from its mouth, thus greatly facilitating the Odessa grain trade.

THE magnitude of the Norwegian fishing industry cannot be better illustrated than by the fact that, although the season of 1899 was one of the poorest on record, the catch included 34,500,000 cod and 136,600 tons of herring.

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MAP OF NORTH EASTERN CHINA

PREPARED IN THE
WAR DEPARTMENT, ADJUTANT GENERAL'S OFFICE,
MILITARY INFORMATION DIVISION,
WASHINGTON, U.S.A.
1900.

SCALE
0 10 20 30 40 50 MILES.

CONVENTIONAL SIGNS.

- Boundary of Provinces.
- Boundary of Mongol clans or banners.
- Fu—Capital of Province.
- Fu—Prefectural City, or City of 1st order.
- Chi-li-Chou or simply Chou—Independent Department City, or City of 2nd order.
- Chou—Department City, or City of 2nd order.
- Hien—District City, or City of 3rd order.
- Thing—Subprefectural City.
- Yi—Post-town.
- Small Town, Village.
- Imperial Tombs.
- Mountain Pass.
- Main Roads.
- Smaller Roads.
- Rail Roads.
- Rail Roads Projected.
- Great Wall.
- Place where a river becomes navigable for larger boats.
- Place where a river becomes navigable for smaller boats. Heights in feet.

NATIVE TERMS IN USE.

At the end of geographical names:

Kiang, Ho, Tchuan, Ula, Myren, Tchu — Stream, River.
Shui, Kou, Thsuen, Khi, Gol, Usu — Streamlet, small River.
Hu, Nor, Omo — Lake.
Po, Tsé, Tien — small Lake, Swamp.
Hai — Sea, sometimes Lake.
Tao, Shan (properly meaning mountain) Island.
Than — Rapids.
Sha — Sands.
Shan, Alin, Nada — Mountain, Mountain Range.
Ling — Pass over a Mountain ridge, sometimes Mountain range.
Khou — Mouth of a River or Pass, often used to designate a place situated at the mouth of a River or Pass.
Tchéng, Chén, Balgasu, Holé or Holun-Tchen, large Village.
Chuang, Phu, Tien, Thsun, Tsi, Thun, Seû, Tchang — Borough, Village.
Kuan, Chai, Ying, Se, Wei — Fortified military Place, Camp.
Khiao — Bridge.
Miao — Temple. Mên — Gate.

At the beginning of geographical names:

Ta — Great.
Siao — Small.
Pei — North.
Nan — South.
Hei (in Mongol Hara) — Black.
Huang (in Mongol Shara) — Yellow.
Pai or Po (in Mongol — Tsagan — White.
Si — West.
Tung — East.
Shang — Upper.
Hia — Lower.

INDEX MAP

Scale.
0 100 200 300 MILES.

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